Creation Research Society Quarterly

Haec credimus:
For in six days the Lord made heaven and earth, the sea, and
all that in them is, and rested on the seventh. - Exodus 20:11

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KANAB CANYON LOOKING NORTH FROM GUNSIGHT POINT

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CREATION RESEARCH SOCIETY

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Some impressions in the Kayenta Formation near Tuba City, AZ resemble contemporary human tracks quite closely. Photographs by Jeremy Auldaney.

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CREATION RESEARCH SOCIETY

History The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly puublication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and about 1100 nonvoting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as the outstanding publication in the field.

Activities The society is solely a research and publication society. It does not hold meetings or engage in other-promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. The Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are $22.00 ($27.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 8263, St. Joseph, MO 64508-8263. Sustaining membership for those who do not meet the criteria for voting membership and yet who subscribe to the statement of belief, is available at $22.00 ($27.00) foreign) per year and includes a subscription to the Quarterlies. All others interested in receiving copies of all these publications may do so at the rate of the subscription price for all issues for one year: $25.00 ($30.00 foreign).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment; are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

EDITOR'S COMMENTS

In Creation Research Society-sponsored research, the Research Committee grants money to fund proposals that a majority of the committee feels are worthwhile. This issue contains reports on three of these projects.

How did the Grand Canyon originate? One creationist idea involves the rapid discharge of post-Flood lakes. Were there two lakes, three lakes or what? The cover of this issue shows Kanab Canyon, a side canyon of the Grand Canyon, and one that is not easily accessible. Emmett Williams, Robert Goette, and John Meyer present an article describing what their preliminary field research uncovered about this feature.

Jeremy Auldaney, Paul Rosnau, Edwin Back, and the late Norman L. Davis offer a new report on the human-like and dinosaur track impressions found in ancient rocks of Northern Arizona. While the pictures and data seem to become more and more convincing, the question arises: How would the tracks originate in a Flood model scenario? The authors offer some possible ideas.

Carl Froede offers another descriptive paper involving the Big Bend National Park, Texas. He discusses an unconformity boundary exposed in the park, and possible scenarios for explaining the deposition of these strata.

James R. Hughes examines the assumptions of an article titled "Eden's geography erodes Flood geology" which appeared in another journal. Since the other journal's article used textual evidence in attempting to undermine our concept of Noah's Flood as being worldwide, Mr. Hughes offers an examination of some assumptions the article made.

In some excellent statistical studies, Kevin Peil documents the prevalence of beliefs in animism among public school students. Since evolutionary paradigms seem to ascribe to matter an ability to organize itself, we wonder whether these animistic beliefs are a result?

George Howe examines some interesting news. Living bacteria and other living microbes have been isolated from the abdomens of fossil bees thought to be 30 million years old. Could some minuscule respiration rate, a cryptobiotic state, keep spores or other cells alive for millions of years? Or could it rather be that the age of millions of years has been overestimated? Ken Olson, in a letter to the editor, examines a similar question for deep dwelling bacteria.

The mathematical validity of isochrons and their meaning, rates of population growth, and other questions are also examined in shorter features of this issue which I hope the reader will enjoy.

Eugene Chaffin, Editor, CRSQ

PRESIDENT'S REMARKS

Another year has passed since I had the pleasure of reporting on the activities of the Society to you. Since our major efforts are in the areas of publishing and research, we maintain a low profile. In an age of hype and overstatement, the Creation Research Society is an anomaly, but we have always operated in this manner. In the 1960's, someone wrote to our secretary, Dr. William (Will) J. Tinkle asking who we were, what organizations supported us and with who were we affiliated. Will sent the inquirer our statement of faith, explaining simply that we are just ourselves. You can read a brief history of the Society, a list of our activities and our statement of belief in every issue of the Quarterly and discover what we represent. We have not veered from the goals set by the founding members.

We still have on our Board of Directors one of the original team of ten, Dr. Duane T. Gish. He can testify that although business practices may have changed, we are still the same Society dedicated to the statement of faith devised 34 years ago. To me the founding and development of the Society was a miracle in itself. Publishing a quarterly journal "starting from scratch" is a monument to the early efforts of Walter Lammerts supported by the original team of ten. Always in the background has been the intent to please the Creator to Whom all efforts are dedicated.

Tremendous strides have been made in the re-evaluation of science from the concept of dynamic special creation over the years. These efforts continue under the direction of the present Quarterly editor, Gene Chaffin, assisted by the editorial committee and a small army of peer reviewers. New books and monographs are being published under the direction of our Publications Committee. The Board of Directors applies a light hand of guidance on the various phases of our work. Actually, much of what we do originates as manuscripts submitted by our members. Your letters to the editor on various topics generate discussion on the creation model of science. We are not elitist in our approach and what we publish depends primarily on the manuscripts received and the reporting of research activities by field and laboratory workers.

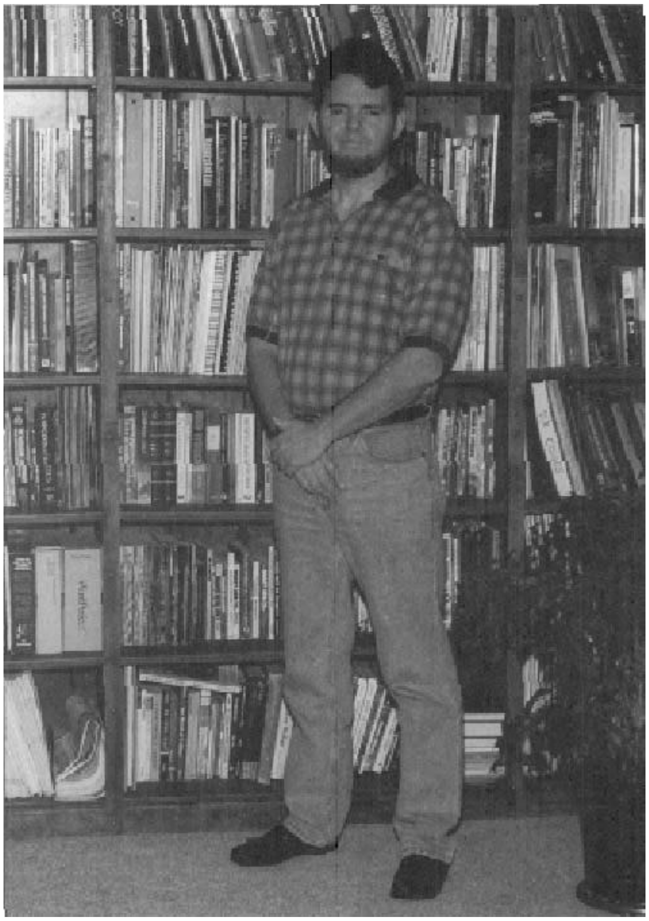
Our most publicized advancement in recent years, which was the culmination of years of planning, coordination and fund raising, has been the establishment of the Van Andel

Creation Research Center in Chino Valley Arizona. Many field study reports which were written by scientists working out of this Center will appear in future issues of the Quarterly. Also the Newsletter and CRSnet are relatively newly-developed activities spearheaded by Glen Wolfrom and Lane Lester.

The financial support from our members sustains all of our efforts. We ask that you encourage your colleagues to join the Society to help us. Also if you will ask various educational and scientific institutions to subscribe to the Quarterly, it will aid in the propagation of the creationist world view. May you have an enjoyable Holiday season and please express your views to either me or to the Quarterly and Newsletter editors. Likewise, CRSnet is another means whereby you may express your views on creationist topics. We look forward to your input.

Emmett L. Williams

PERSONALITIES IN CREATIONISM



Michael J. Oard is a very prolific creationist researcher and writer as well as a proficient field worker. He has written extensively on the type of ice age that would have developed after the Genesis Flood. The term “warm ice age” is synonymous with his work. His years of thought and study on this topic have borne fruit in the production of several articles and monographs on the subject.

Born in Seattle, Washington in 1945, he graduated from Seattle Preparatory School in 1963 and spent the years 1964-1966 serving in the U. S. Navy. Oard received a B.S. and M.S. in atmospheric science from the University of Washington. He also worked periodically as a Research Assistant at the University from 1966-1970 and again in 1972-1973. His other professional employment has been with the National Weather Service. Having been associated with the Weather Service continuously since 1973, he is currently lead forecaster at the Great Falls, Montana station. When he has spare time, Michael enjoys being out-of-doors. He prefers jogging, backpacking, fishing and hunting. Once he hiked the Cascade Crest Trail from Oregon to British Columbia in 45 days. Also his outside activities have led him into field work in geology as he has developed a keen interest in the subject.

He and his wife, Beverly, have four children and one grandchild. Creationist research, literature study and field work, full-time meteorology, hiking the trails in the Northwestern United States, and family responsibilities ensure that Michael is a busy man. His writings on the Flood and a postulated subsequent ice age are excellent. It was our privilege to publish many of his articles, notes and letters in the *Creation Research Society Quarterly*. His most recent monograph on massive submarine landslides, often mistaken as ancient ice age deposits, was published by Creation Research Society Books. Likewise he has written articles for *Creation Ex Nihiho Technical Journal* and *Origins* and has spoken at all of the International Conferences on Creationism held in Pittsburgh. Besides his outstanding publication and speaking record in creationism, Oard is very active in his profession of meteorology where he has written several articles and memoranda for secular publications. He is a member of the American Meteorological Society and the Creation Research Society and is listed in Who’s Who in the West. It is a pleasure to feature Michael Oard for his many contributions to the cause of creationism.

Emmett L. Williams

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*See p, 63, *CRSQ* Volume 34, June 1997 for the announcement of Michael Oard’s new book: ***Ancient Ice Ages or Gigantic Submarine Landslides.***

MORE HUMAN-LIKE TRACK IMPRESSIONS FOUND WITH THE TRACKS OF DINOSAURS IN THE KAYENTA FORMATION AT TUBA CITY, ARIZONA PART II: PHOTOMICROGRAPHIC STUDY AND COMPARISON OF QUASIHUMAN ICHNOFOSSILS WITH MODERN TRACKS

Jeremy Auldaney,* Paul O. Rosnau,** Edwin Back,*** and Norman Davis****

Received 3 July 1995; Revised 1 March 1997

Abstract

This is the second part of a report of research on quasihuman ichnofossils (supposed human tracks) found with tracks of dinosaurs in strata near Tuba City, Arizona. The material for study was collected on field trips June 21-27 and October 15-18, 1990 and June 1-6, 1995. This project is a continuation of previous research (Rosnau, P., J. Auldaney, G. Howe and W. Waisgerber, 1989 a, b).

Photomicrographic analysis indicates that the human-like impressions were created by pressure which created relatively smooth surfaces, unlike the rougher surfaces of impressions formed inside concretions and unlike surrounding surfaces. Comparison of the quasihuman ichnofossils with modern tracks in wet mud shows them to be closely comparable, supporting our theory that the fossil imprints were made by human feet.

We append a list and description of newfound quasihuman imprints, present the authors' summaries, offer a refutation of the Paleo-Indian theory of fossil track formation and answer other criticisms.

Photomicrographic Analysis

The biggest challenge we faced in this research was to find a test which would differentiate quasihuman ichnofossils from forms created by calcic concretions eroding out of the sandstone and leaving behind track-like shapes. Is there a way to distinguish them? Some of the impressions in our study area are obviously concretions, but there are also trackways of human-like foot impressions facing the same direction and occurring in a right-left sequence. Trackways exist in which all humanoid impressions appear to be shod while in other trackways all are consistently barefoot. There are side-by-side humanoid prints consistently facing the same direction. How are we to account for so many quasihuman ichnofossils concentrated in the same small area? There are too many coincidences to assign the cause to pure chance.

Navajo regulations do not allow us to use the method employed by others to test putative humanoid tracks along the Paluxy River in Texas, i.e., to slice the track in half to observe if the layered sediment shows pressure patterns such as would be made by a creature's foot (Helfinstine, 1994, p. 39). A genuine track would show dips in the layers while a track-like shape produced by weathering would cut through layers which would remain horizontal.

Unable to use this method, we decided on the microcompaction method pioneered by Dr. Wilbur Greely Burroughs, Head of the Geology Department at Berea College in Kentucky. Burroughs studied human-like tracks in Kentucky dated as Carboniferous, assumed to be 250 million years old (Ingalls, 1940; "Human-like tracks," 1938a; "Geology and ethnology disagree," 1938b). Auldaney, like Burroughs, using a mineralogist's magnifying lens, noted that the surfaces of fossil animal tracks are smoother than the surrounding rock surfaces, simply because the tracks were originally pressed into soft mud. Auldaney found smooth surfaces in fossil tracks of birds in the Eocene Green River Formation of Wyoming, in amphibian and reptile tracks in the Permian Coconino Formation of Arizona, in dinosaur tracks in the Jurassic Connecticut Valley of Massachusetts, in dinosaur tracks in the Jurassic Aztec Formation of California, and in camel tracks in the Miocene Barstovian Formation of California. Auldaney also observed that the smooth uneroded surfaces inside animal tracks contrasted visibly with the surfaces inside concretion impressions, which were about as rough as the surrounding surfaces.

Methods Used

Norman Davis, a retired optical engineer, offered to construct a photographic rig for the purpose of shooting photomicrographs. With the photomicrographs we would have an improved version of Burroughs' method, revealing the difference of tracks from concretions.

Davis's equipment consisted of a Nikon N2000 camera with a lens of 135 mm focal length. Tubes of 13" and 18" length were alternately attached to the camera's bellows to produce two strengths of magnification, 15X and 33X. A wooden jig adapted the camera to the undulating terrain of our Site 2.

---

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***Edwin Back, P.O. Box 280384, Northridge, CA 91328.
****Norman Davis, deceased June 6, 1995.

Davis photographed inside and outside three quasihuman ichnofossils, Numbers 39, 51 and 62. He also photographed two concretion impressions (Figures 15 and 18). The photos indicate that impressions with concretion features exhibited rough surfaces no different from the surrounding matrix. Quasihuman ichnofossils, on the other hand, showed smooth interior surfaces, in contrast to the surrounding rough-surfaced matrix.

The Photomicrographs

Photomicrographs in the left column are taken inside the tracks. Those on the right are taken immediately outside.

Conclusions from Photomicrographic Tests

Humanoid ichnofossil 39 is smooth,

Humanoid ichnofossil 51 is smooth.

Humanoid ichnofossil 62 is smooth.

Concretion 1 is smooth.

Concretion 2 is rough.

The results were mostly as expected but one was a complete surprise. Concretions 1 and 2 were selected as control specimens to show what nodular erosion would look like under magnification. However. instead of a rough interior surface concretion 1 had a smooth surface, evidence of compression! It is located just to the right of impression 49-5 in the Downhill Trail, a trackway of 18 putative humanoid foot impressions. Thus, concretion 1 could be the ball of a humanoid track in the process of eroding out of its overlying matrix (Figure 15 and 21).

Comparison of Fossil Tracks with Identified Modern Tracks

No paleontological research is complete, until fossils are compared to similar organisms, living or extinct, for identification. The pictures on the left are contemporary human tracks made in gummy mud similar to the sediment at Tuba City before it lithified. Those on the right are quasihuman ichnofossils at Site 2 at Tuba City.

Examination of the contemporary tracks, both shod and barefoot, walking and running, indicates very little difference regardless of whether the mud is very wet or almost dry. Detail is usually lacking. Some fossil prints at Tuba City appear similar to tracks made in puddles of water, which lack features such as toes or shoe outlines. Some of the barefoot contemporary tracks exhibit toe gouge marks in the deep mud similar to the toe-like gouges in the putative, double Track 6 Auldaney found at Site 1. (See conclusions by Auldaney below). Also, details of contemporary tracks are often distorted by a suction effect of sticky mud as the foot is withdrawn. Such was our experience after heavy winter rains at Site 1. Note the distortion in the ichnofossil pictured in Figure 33.

In summary, most of the fossil humanoid features appear to have been made in semi-wet mud, which seldom leaves diagnostic features other than general shape, similar length and width. Our observations of modern tracks show that isolated single tracks appear while their mates were not impressed due to varying amounts of water in the matrix, caused, for example, by the sloping or non-sloping of the sedimentary medium or by one foot stepping in a mudpuddle and the other avoiding it.

Conclusions of Auldaney

In our report (Rosnau et al.; 1989b, p. 92) I gave 10 reasons why some of these impressions may be human tracks and eight reasons why they may not be tracks of anything. In that report I stated that the evidence convinced me that a few of the quasihuman ichnofossils could be “human tracks but there [was] insufficient diagnostic evidence to establish it firmly one way or the other” whether they were tracks or nodule impressions (p. 94).

Continuing research has not revealed any new evidence against the track theory; it has instead falsified some of my earlier objections and has greatly increased the evidence in favor of the impressions being of human origin. Thus after six years of research several of my conclusions have changed.

New Data Support Human Track Theory

Here are the changes:

(4) Previously (p. 94) I believed that at Site 2 there were 23 good quasihuman ichnofossils which held a strong possibility of being human tracks; I now believe after more detailed study and the resultant increased data that there are about 34 candidates.

(7) The putative child or woman-size track 41, at right angles to the Classic Track 39, I now realize is part of a possible trail of prints similar in size and features. This includes 42-2,46,47(?), 48-2 and 48-3.

(10) The putative double print 6 which I found at Site 1 was in a possible trail of three tracks, numbers 6, 5 and 4. All are the same size and are aligned in the same direction. Impression 6 is 30 cm (one foot) behind impression 5. In the 1989 paper impression 6 was incorrectly mapped.

Evidence against Human Track Theory Falsified

(3) Previously I said the mounds gave no sign that they were part of a track layer because they were not flat like the majority of known dinosaur track horizons in the area. That is absolutely incorrect as I have located a flat dinosaur track layer on the north edge of Site 2 similar to one east of Site 1. Also, the unmistakable tracks of *Eubrontes giganteus (Dilophosauripus)* are found in mounds in the Navajo Formation in Colorado which are identical to the mounds at Site

2 at Tuba City. These mounds and tracks can be seen in photographs in Lockley (1991, Plate 8).

(4) Previously I pointed out that the Tuba City mounds were not horizontally stratified like most track layers. With further research I discovered that they are a part of the Navajo Formation of crossbedded sandstone formed from dune-like cross stratification depositions identical to the typical Supai (Esplanade), Moenkopi, Coconino and Wingate Formations which erode into mounds and commonly contain fossil tracks. (The Kayenta layer is sandwiched between the Wingate below and the Navajo Formation above. All appear to be members of one formation.)

Conclusion of Auldaney

Since 1990 I have discovered and studied several fossil track sites and noted hundreds of undisputed tracks. I found that the strongest evidence, which makes the identification of fossil tracks unmistakable lies in the clear repetition of identical features, correct trackway alignments, and unmistakable details of the foot.

The impressions in the crossbedded sandstone mounds at Tuba City are a poor medium for the preservation of track details and thus lack these definite features. Also, there are concretions which have a tendency to erode out and produce track-like shapes.

As believers in the absolute accuracy of the Bible, we know men and dinosaurs coexisted, because the Bible clearly states that men and all terrestrial creatures (including dinosaurs) were created on the fifth day, within 24 hours (Genesis 1:24).

The question we face at Tuba City is whether these imprints in stone which resemble human prints are proof of this fact. The question for the critic is, do you believe God’s Word or man’s constantly evolving speculation?

Jesus said (Matthew 12:39) that “An evil and adulterous generation seeketh after a sign (proof); and no sign” would be given except Jesus’ resurrection from the dead. In Luke 16:31 Jesus tells us that, “If they hear not Moses and the prophets (i.e. the Bible), neither will they be persuaded, though one rose from the dead.” II Peter 3:5, explains that unbelievers “willingly are ignorant” of evidence of the Flood.

Maybe this is why God has not given us absolute proof that men and dinosaurs coexisted, because He requires faith (Deuteronomy 32:20, Habakkuk 2:4).

There is overwhelming scientific evidence in support of the creation account-but God always leaves room for man to reinterpret the facts to fit his own ideas, because “a man convinced against his will, remains unconvinced still.”

The most important part of this research is not to prove these quasihuman ichnofossils are human tracks, but the integrity and honesty of our work in presenting both positive as well as negative evidence. We do not have to seek only the evidence which proves our preconceived conclusions. Creationists are the only scientists who can be truly objective, because we seek only the truth. And if we are wrong-we want to know it. Circular reasoning only supports false beliefs.

We will have succeeded if we only succeed in demonstrating how true science (a rarity today) is conducted. The evidence at Tuba City has and will continue to convince creationists and unbiased observers that there are human tracks there with dinosaur tracks; and evolutionists will be convinced that all we found are mineral concretions.

Therefore, proof that these are man tracks will not be found until a clear human trackway is found in the flat track layer 166 feet north of the mounds. Here is where I discovered undisputed trails of small theropod dinosaurs at Site 2. The same place Eryl Cummings reported he saw barefoot human child’s tracks followed by small dinosaur tracks 20 years earlier.

Until this time, my conclusions are that the evidence is strong, but inconclusive, pending further discoveries.

Conclusions of Rosnau

If our research were done for forensic purposes (i.e., if we were detectives searching for footprints which would implicate certain individuals in a crime) then, it seems to me, there would be no question by anyone that man trod the mounds of Site 2. In forensic research the criminal need not necessarily be caught *flagrante delicto.* Circumstantial evidence such as footprints is used as evidence to implicate a suspect for further investigation.

We have seen no people or dinosaurs trekking across Site 2, but we have seen strong evidence which duplicates human skid tracks, side-by-side tracks, barefoot tracks, shod tracks, adult tracks, child tracks, trackways, a child falling down on its hands and knees-all mingled with tracks which appear to be those of dinosaurs slipping and sliding in the mud. The absence of further evidence of man, such as human skeletons and goods of human manufacture, does not make our case inadmissible to investigation. The footprints, hand impressions, trackways and the 182 meters of overlying ash and sandstone lenses lead to one conclusion: man walked these mounds a long time ago under dire circumstances. Dinosaurs perished with him under volcanic ash and muddy floodwater.

It would be an injustice and bad science to rule out a priori the existence of human tracks in Jurassic strata just because current opinion says they cannot be there. People, also some Christians, will continue to be skeptical of what we have found because American society has been schooled to separate dinosaurs from men. But demonstration of empirical facts has shattered many a misconception. The photos in this paper speak for themselves.

(See Appendix I for a response to the Paleo-Indian theory of origin of the humanoid tracks.)

Conclusions of Back

Water ripple marks, quasihuman ichnofossils and dinosaur tracks are found in the Kayenta Formation near Tuba City. While some of the marks may be the results of concretion, erosion or nodule formation, there are marks that display human-like features involving stride, trackways, side-by-side tracks, skid tracks, a falling down on hands and knees, toe impressions and shoe impressions. These details are strongly suggestive of human origin and probably some of the marks are authentic human ichnofossils. Further research including excavation and the search for human artifacts or bones should be undertaken.

There is another site outside the USA where individuals report finding fossilized footprints of dinosaurs and humans together. Golovin (1996, p. 52) reports that the Russian journalist Alexander Bushev verified a 1983 report of human tracks with those of dinosaurs in a Jurassic stratum near the village of Khodga-Pil in Turkmenistan.

Even if only one human track in a Mesozoic stratum anywhere was real, it would offer a significant challenge to the present tenets of historical geology.

The water ripple marks remain a mystery to me, for as yet I have not heard a theory that adequately explains the formation and preservation processes. It is not enough to be able to name one or two minerals involved in the processes; an adequate understanding of the chemical reactions and their reaction rates is desired.

The more work given to this project, the more the sites yield exciting finds. These quasihuman ichnofossils deserve further research.

Conclusions of Davis

The sandstone knolls at Site 2 are made up of pure white silica grains, heavily stained red with hematite to a depth of several feet. The hematite is very finely powdered, fine enough to polish glass. It is of volcanic origin.

The ichnofossils at Site 2 were first covered with red-stained sediment about a foot thick, then with pure white silica 4 to 6 inches thick and then, judging from the nearby stratified mesas, by several hundred feet of red bentonite sediment alternating occasionally with white sandstone.

Using the Flood model, one can well envision the sky filled with finely powdered hematite, which in turn was brought to earth by rain droplets. The white sandstone strata represent brief periods of volcanic inactivity, where only rain and/or floodwater brought in more sediment.

Apart from the many nodules at Site 2, the tridactyl tracks at Site 2 are clearly those of dinosaurs. The human-like tracks, both shod and barefoot, are clearly those of humans-man, woman and child.

Appendix I

Are the Man-like Impressions Paleo-Indian Tracks?

A few people have suggested that the humanoid impressions at Tuba City could be the tracks of Paleo-Indians mingled with those of dinosaurs but made by these people much later, i.e., in the Ice Age. Such a theory would have to assume either that the dinosaur track stratum remained soft for great lengths of time without distortion of the tracks, or that the hardened sandstone temporarily softened to accept the human footprints, also without distortion of the dinosaur tracks.

Neither scenario is realistic. The limy sandstone in which the humanoid tracks lie is physically akin to hardened cement. Such a stratum only very slowly weathers into sand. One would not expect it to soften rapidly any more than one would expect a concrete sidewalk to soften rapidly. The eroded sand grains at Tuba City, when wetted, form a gummy clay, but do not harden again into sandstone. A clear unconformity exists between the exposed mounds bearing the fossil impressions and the unconsolidated alluvium which collects in low spots where modern unfossilized tracks might temporarily be found. Thus, if the impossible were possible and the stratum with dinosaur tracks were softened to accept human tracks, the dinosaur tracks would be destroyed and the tracks of man would not remain. Humanoid impression 48-1, found in a disintegrating state in 1990, eroded to broken bits and sand by 1995. (See Figures 3 and 4 in Part I.) There is no re-integration after disintegration.

The absence of any layer of fertile soil in the Kayenta Formation and associated strata excludes normal conditions for life. Immediately below the Kayenta at Site 2 one sees only bentonite. Stratified mesas nearby, consisting of loose bentonite and occasional lenses of sandstone, all rising 182 m above the fossil impressions, attest to an inhospitable environment of falling volcanic ash and inflowing water. Man, if one accepts the man-like impressions as those of man, and beast were treading on territory that had been buried under ash and muddy water and which was about to receive more of the same cataclysmic treatment.

The identification of the sandstone mounds at Site 2 with the Kayenta Formation links them to sedimentation on a grand scale. In a creationist/Flood model of geologic history the tracks could indicate a brief period of subaerial activity before what remained of life in Arizona was exterminated. Oard (1995, pp. 50-51) and Holt (1996) propose brief periods of exposed land during the first 150 days of the Flood, the causes being isostatic uplift and/or cyclonic gyres forcing the water away. In such a model the nine acres of site 2 at Tuba City could well have been a temporary island to which man and dinosaur fled.

Appendix II

Answers to Criticism of Our Work

Glen Kuban (1992) listed six problems with our research:

> 1. Ambiguous depressions are often referred to as "tracks" . . . before they are demonstrated to be anything of the kind. (p. 12)

Our answer: We agree, and that is why we stated in our 1989 report that when we refer to footprints, imprints, tracks or man tracks such references "are not to be taken as implying positive identification" and "are still being evaluated as regards their possible human origin" (Rosnau et al., 1989a, p. 42) because some might be concretions.

> 2. . . . even the "best" individual markings in the Kayenta reports show at best a superficial resemblance to human prints. Many bottom contours appear incompatible with genuine tracks. . . . Problematic features were often neglected (p. 12).

Our answer: Negative problematic features of certain imprints have left us undecided as to their origin. Nevertheless on the positive side enough human-like features at the Tuba City sites were found to lead an observer to conclude that many impressions are indeed human tracks. Mr. Kuban has not seen the evidence at Site 2, unpublished until now.

> 3. None of the photos or maps shows a natural striding sequence of even a few paces . . . and individual markings are not consistent or distinctly human in shape and detail. Supposed tracks and trails do not stand out readily from many other equivocal markings distributed in a helter-skelter fashion around them. (p. 12)

Our answer: Considering that the tracks were made in what was once wet sand, one would expect them to vary in length, stride and direction due to slipping and sliding on upgrades and downgrades. Comparison of some humanoid ichnofossils with modern human tracks, as discussed in the present paper, proves the putative man tracks and their strides do appear human.

> 4. Trackway maps are woefully inadequate. (p. 12)

Our answer: In 1987-1989 our work had just begun. This present paper meets this need.

> 5. Alternate explanations are not adequately explored. The authors concede that some of the markings might be concretions, but this and other possible causes for many of the markings are hastily dismissed. (p. 12)

Our answer: We do not dismiss the possibility of other causes since we continue to designate the impressions as human-like tracks. They are either human tracks or they are eroded mineralization features.

> 6. Reviews by independent workers and professional paleontologists are lacking.

Our answer: At our invitation, several independent workers in paleontology have visited our research sites. We are still gathering data on the humanoid ichnofossils and deem it premature to call in outsiders before we publish more information. Our 1989 paper in *CRSQ* and this paper were given careful peer review before publication. We are, in fact, looking forward to personally showing serious students the evidence.

Acknowledgement

Once again we would like to thank the Creation Research Society as well as those who contributed to the Laboratory Fund, interest from which has been used to support our research. We express our thanks also to the Navajo Nation which takes no position on our discoveries. We also wish to thank George Howe for his consultative aid as well as Chris Chui for critical copy reading. We thank Glen Kuban (1992) for a critical review of our previous papers.

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__________1989b. Are human and mammal tracks found together with the tracks of dinosaurs in the Kayenta of Arizona? Part II: A field study of quasihuman, quasimammalian and dinosaur ichnofossils near Tuba City. *CRSQ* 26:77-99.

Table I. Newly identified qasihuman ichnites in an unmapped span of circa 30 meters between the Downhill Trail (H7) and the Classic Mound (H6). NP = no photo herewith. NM = no measurement taken. N.A. = not applicable. ? = periphery unclear, measurement approximate.

Imprint Number	Size (cm) (Length x width of ball)	Comments	Figure Number
55	33? x 12	A bare right foot quasihuman ichnite in stride with 56. A tridactyl dinosaur-like ichnite (D-2) is only 1.1 meters away.	22,23
56	23? X 12	A bare left quasihuman ichnite in stride with 55.	22,23
57	25 X 11?	Clear flat-bottomed right(?) foot impression, enhanced by white calcite crystallization on its interior surface. It could have been made by a human wearing a soft sole moccasin (Morris, 1980, p. 33; Helfinstine, 1994, p. 20).	24
58	N.A	A quasihuman ichnite with raised periphery (center). On the left a track facing the same direction; on the right a track facing the opposite direction.	25
59	31 X 12	A sharp-edged putative shoe print in stride with 59-1 and 59-2. This is a partial trackway.	26,27
59-1	31 X 12	Clear, shallow depression in stride with 59 and 59-2.	27
59-2	NM	Brushing aside the sand we discovered this depression in stride with 59-1 and 59.	27
60	2? X 11	Sharp track-like impression with eroded interior.	NP
61	27 X 8?	Impression resembling the human left foot, including faint toe depressions. Paired with 62.	NP
62	24 X 10	Appears to be a bare human right foot, alongside 61. It has a prominent big toe. See Figure 26, Rosnau et al., 1989b, for photo of 61 and 62 side by side.	12
63	28 X 10	Putative humanoid ichnite.	28
64	22 X 9	Double impression of putative child-size bare left foot. The impression at the right reveals an arch and the length of the foot. The overlying print (left) is of the ball only, and from this, the width is measurable.	29

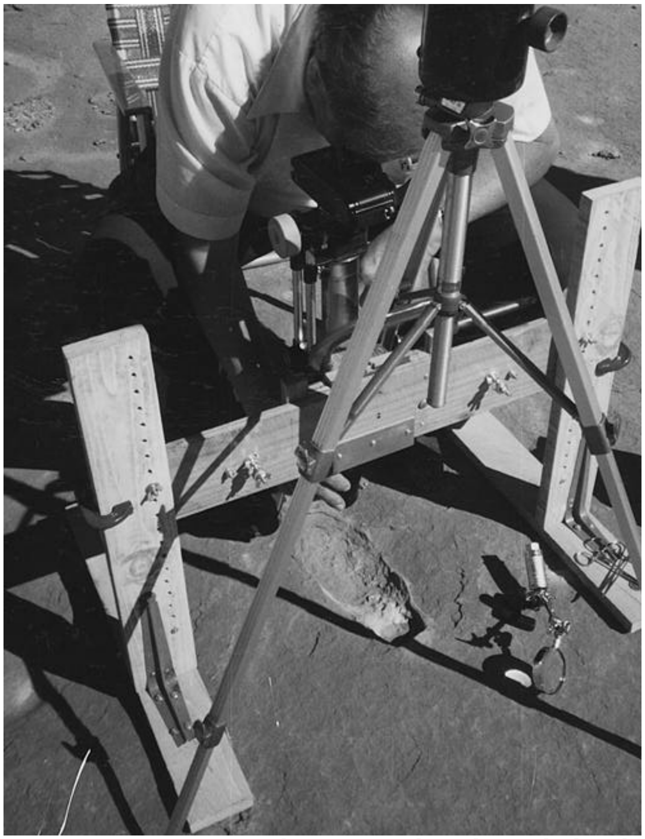

Figure 1. Davis prepares to photomicrograph track 39. The heavily weighted tripod steadies the camera apparatus. The spot being photographed was lit by the sun via a magnifying glass.

Figure 2. Back watches Rosnau examine track 39 with a field microscope. Dan Argenio sits on the eroded-back overlying sandstone which contains dinosaur trackways covered by volcanic ash.

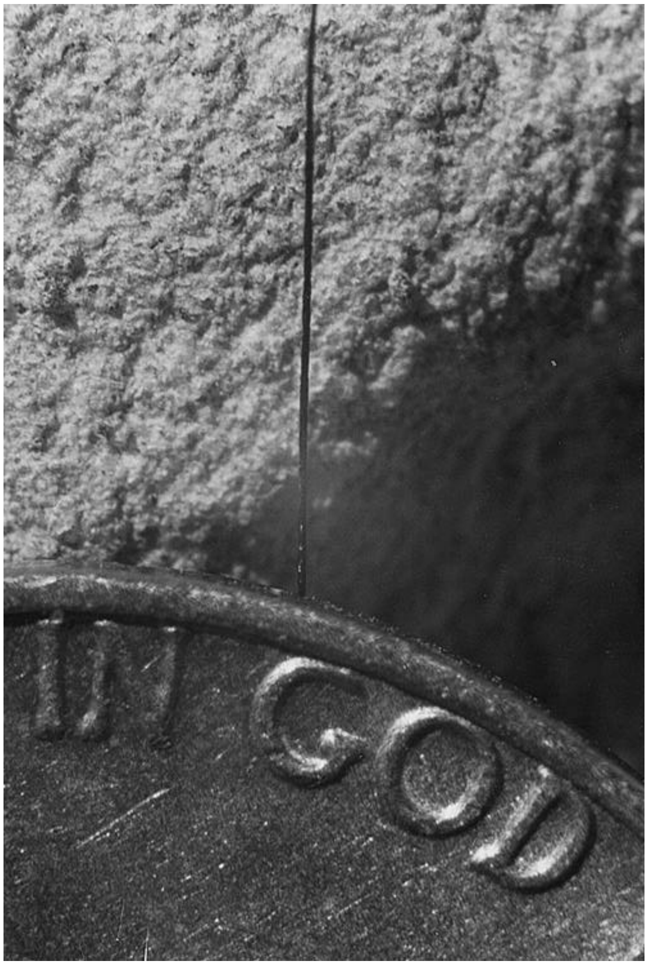

Figure 3. Photomicrograph of a dime and a human hair on the rim of the arch of track 39, for size calibration at about 15X. Hair is about 100 microns wide.

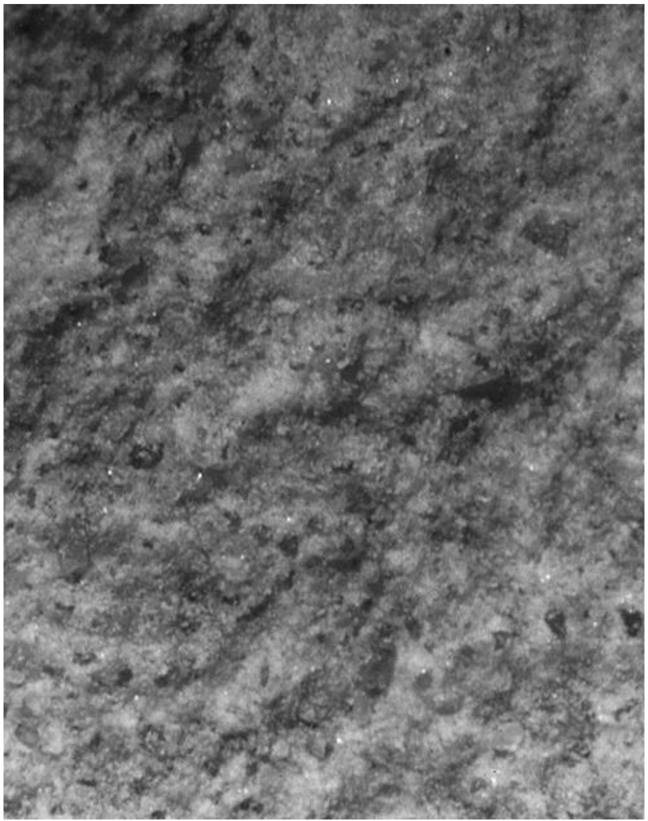

Figure 5. The white calcic surface on the arch inside track 39 magnified 32X (marked by arrow [A] in Figure 4).

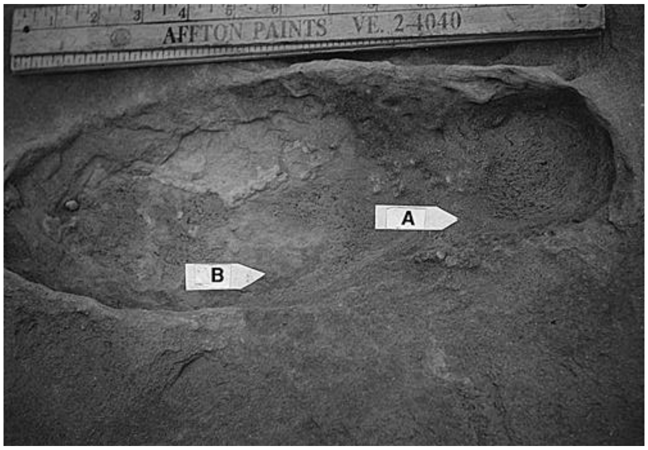

Figure 4. Classic track 39.

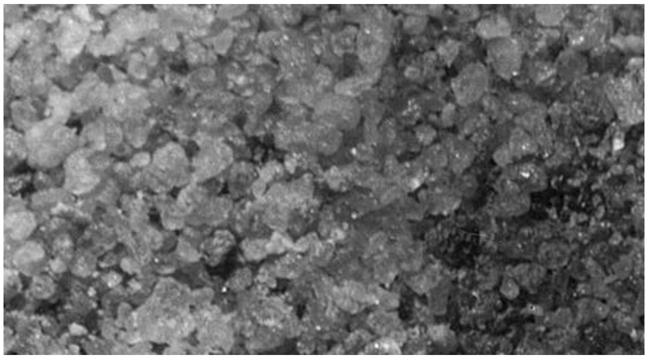

Figure 6. Surface outside track 39 magnified 32X, about 15cm, 45° toward the right rear of the track, the locus shown in Figure 1.

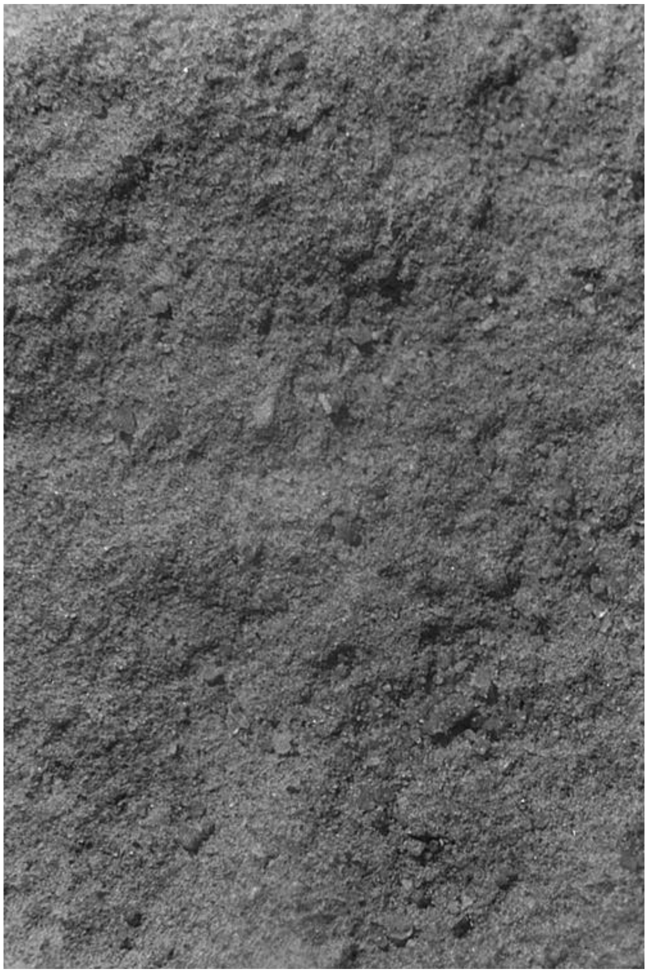

Figure 7. Inside the ball of 39 (marked [B] in Figure 4), magnified 15X.

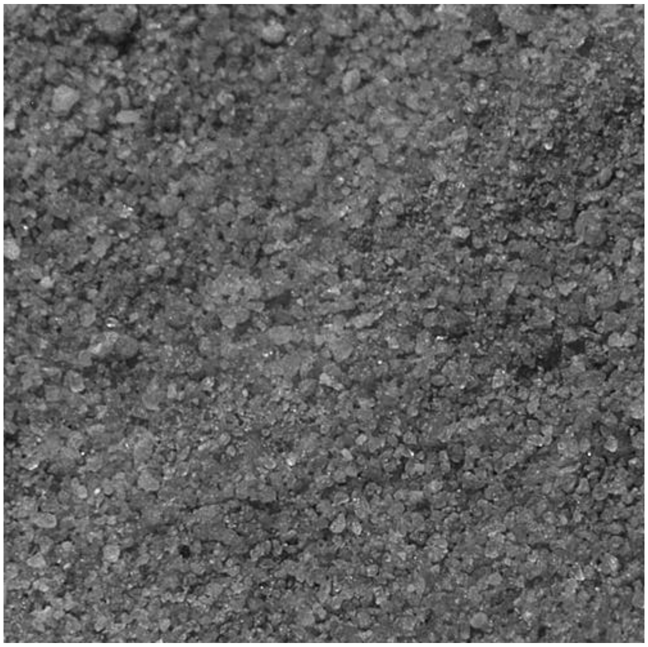

Figure 8. Surface outside track 39 (same as Figure 6 but magnified 15X.

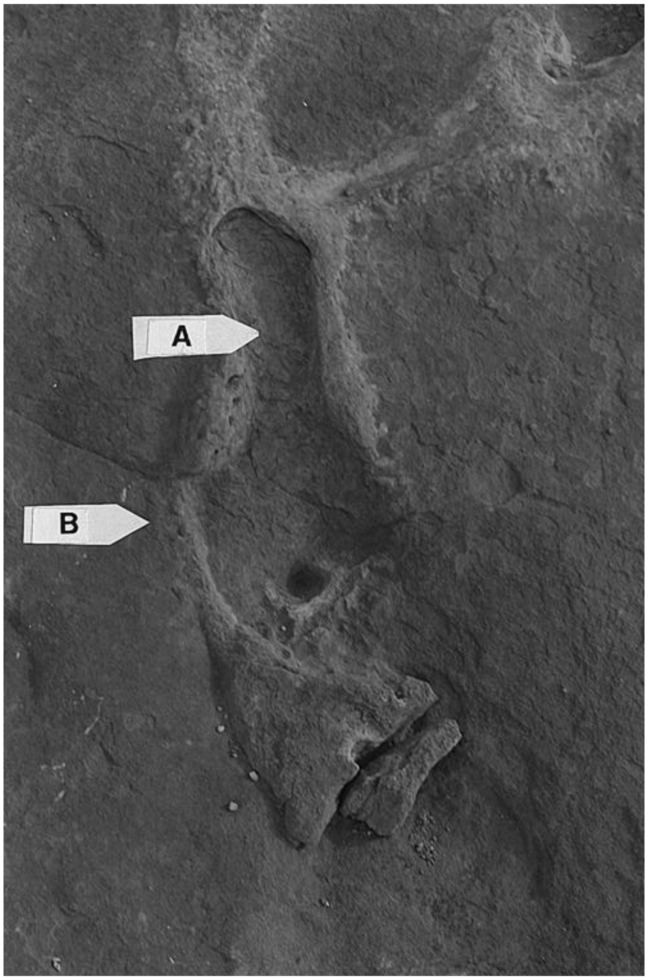

Figure 9. Downhill Trail track 51.

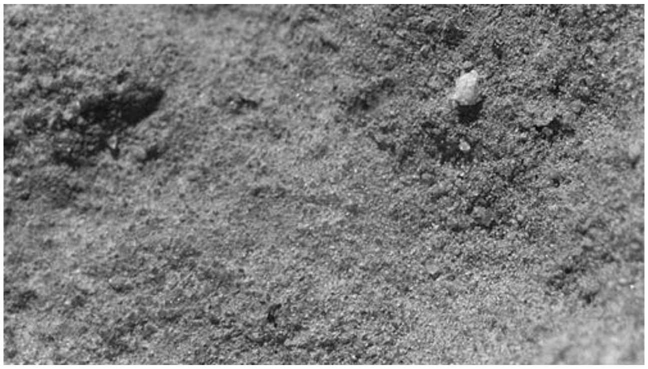

Figure 10. Surface inside the heel of 51 (marked by arrow [A] in Figure 9) and magnified 15X.

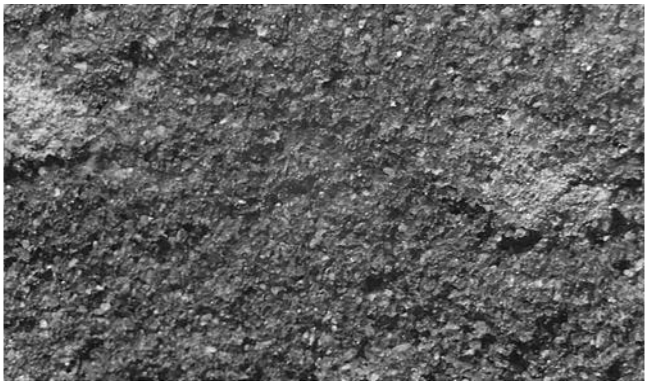

Figure 11. Surface outside 51 (marked [B] in Figure 9) and magnified 15X.

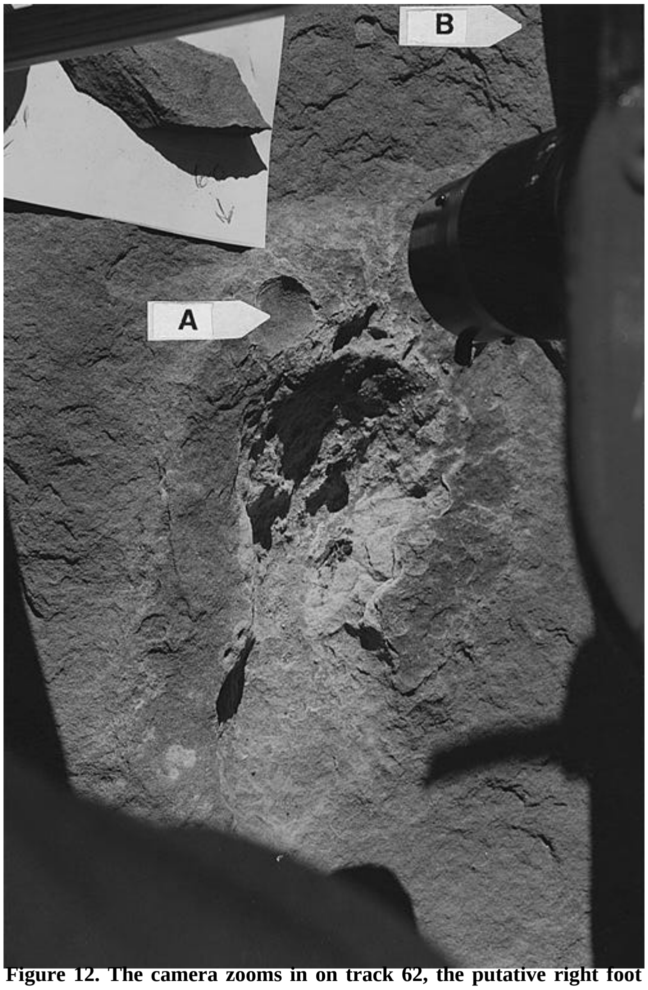

Figure 12. The camera zooms in on track 62, the putative right foot impression of side-by-side tracks 61 and 62.

Figure 13. Inside the big toe of 62 (marked [A] in Figure 12) and magnified 15X.

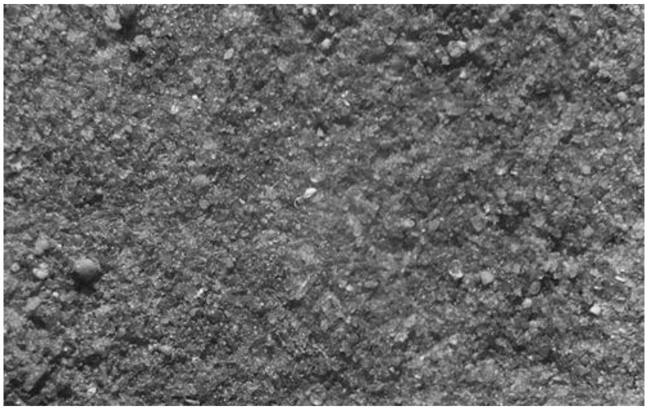

Figure 14. Surface outside 62 (marked [B] in Figure 12) and magnified 15X.

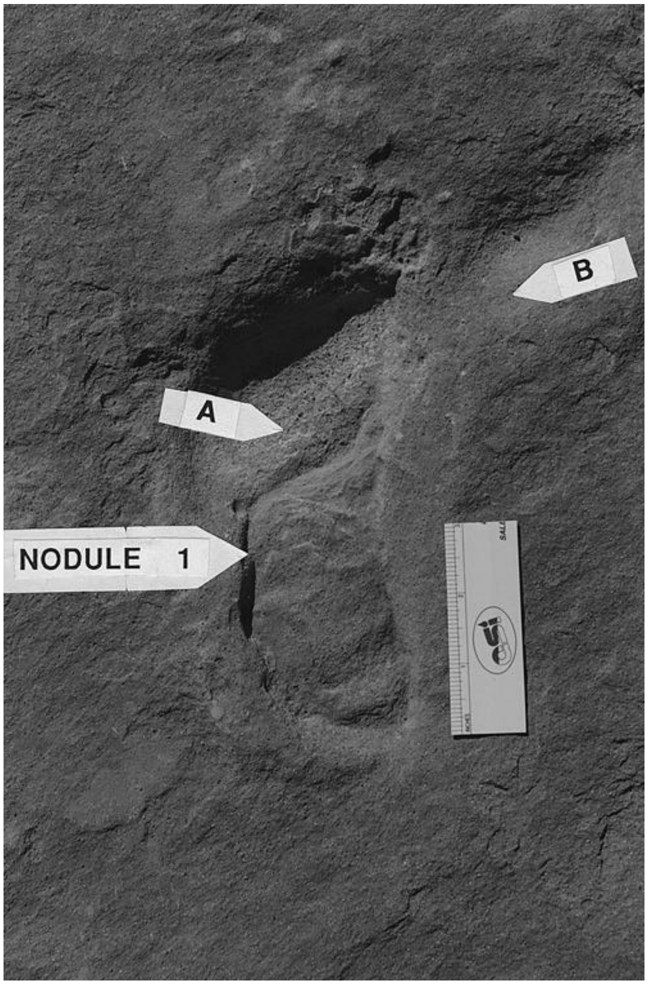

Figure 15. Nodule 1 used as a control specimen for comparison.

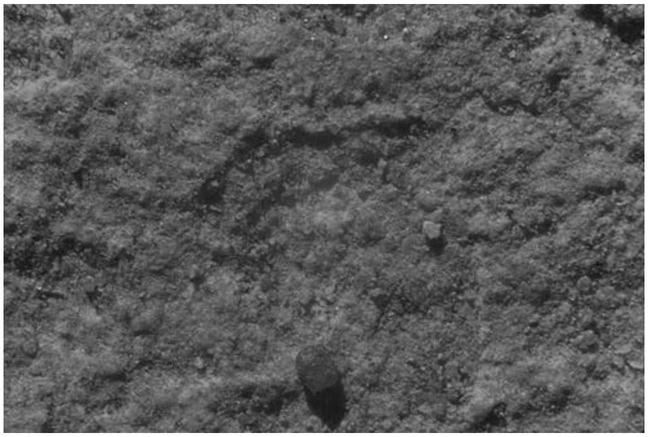

Figure 16. Surface inside nodule 1 (marked [A] in Figure 15) and magnified 32X.

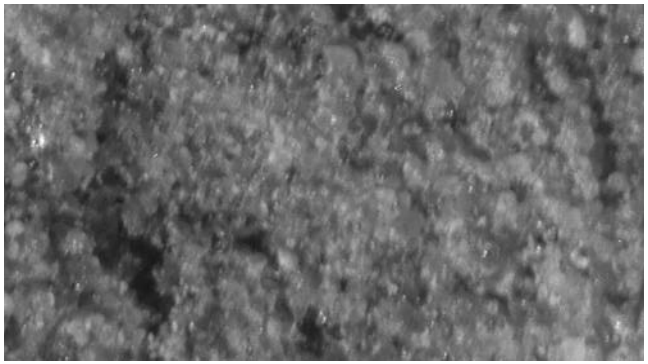

Figure 17. Surface outside nodule 1 (marked [B] in Figure 15) and magnified 32X.

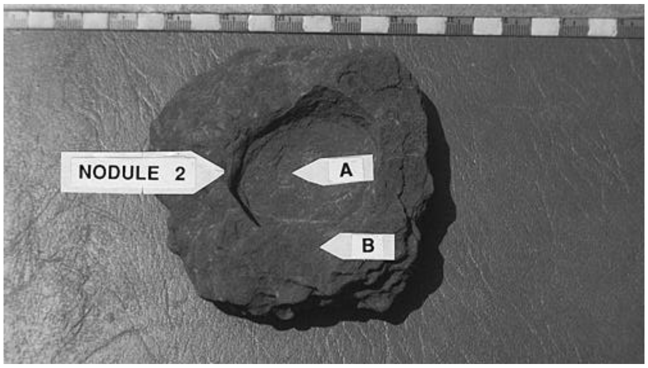

Figure 18. Nodule 2 used as a control specimen for comparison.

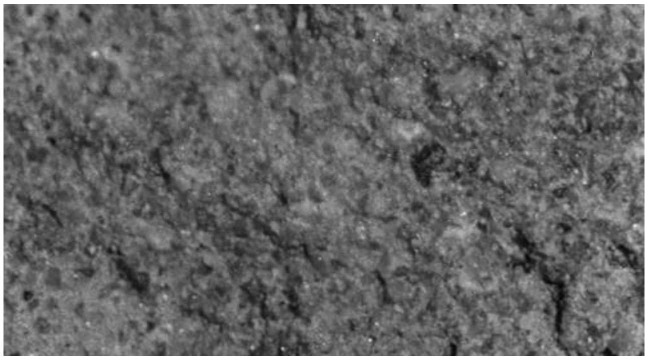

Figure 19. Inside nodule 2 (marked [A] in Figure 18) and magnified 50X.

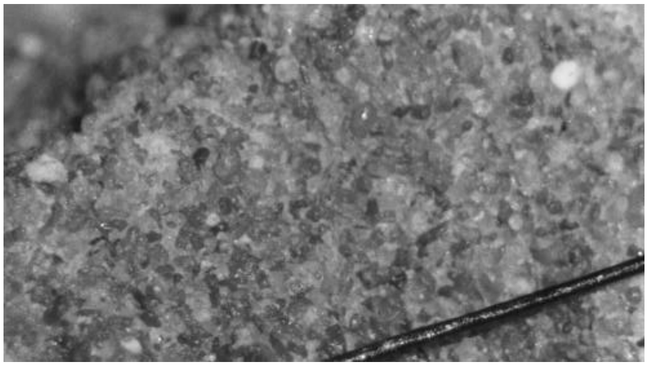

Figure 20. Nodule perimeter (marked [B] in Figure 18) and magnified 50X.

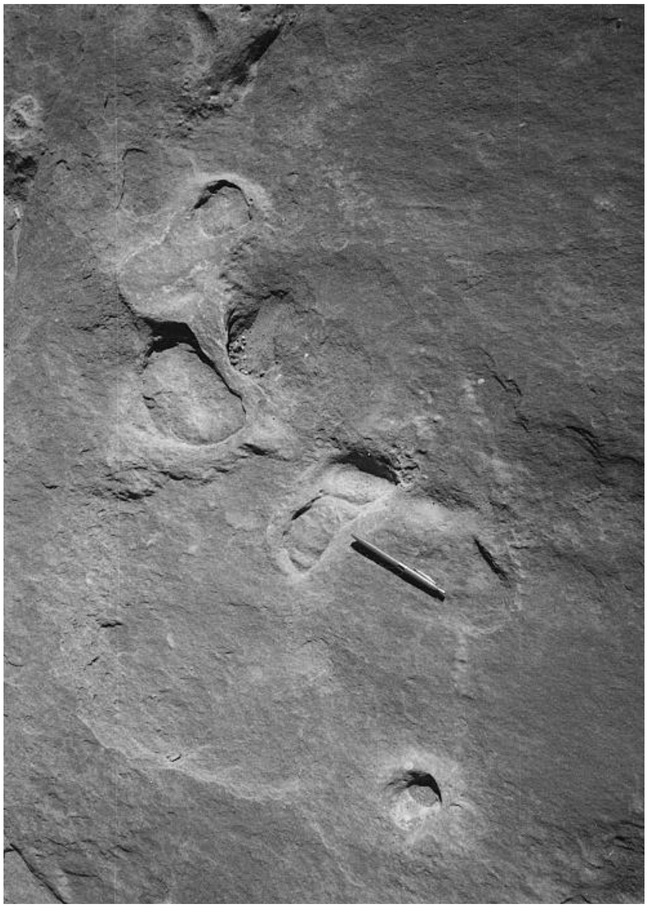

Figure 21. Nodule 1, next to pen, showing surrounding features. The beginning of the Downhill Trail is a few centimeters to the left of the picture.

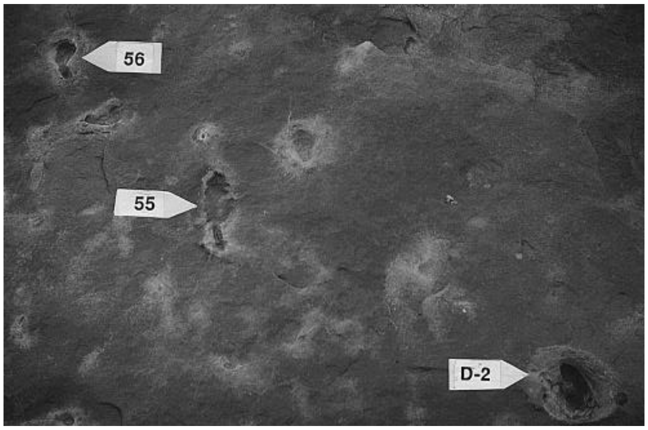

Figure 22. Dinosaur-like tridactyl impression (D-2) shown here is the closest such track to quasihuman ichnofossil 55, which is in stride with 56.

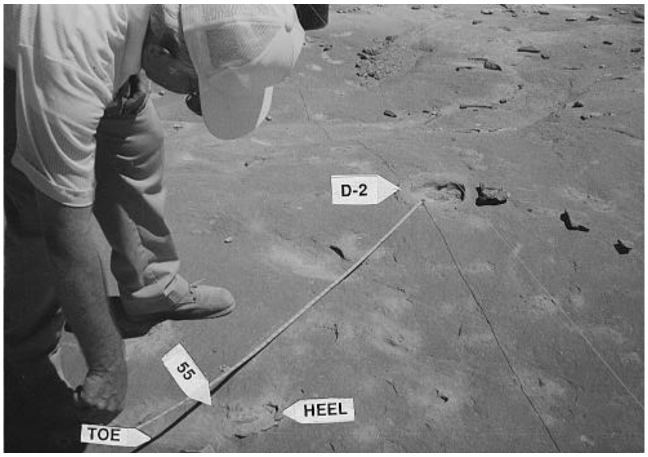

Figure 23. Measuring the 1.1 m between the putative dinosaur track D-2 and putative humanoid track 55.

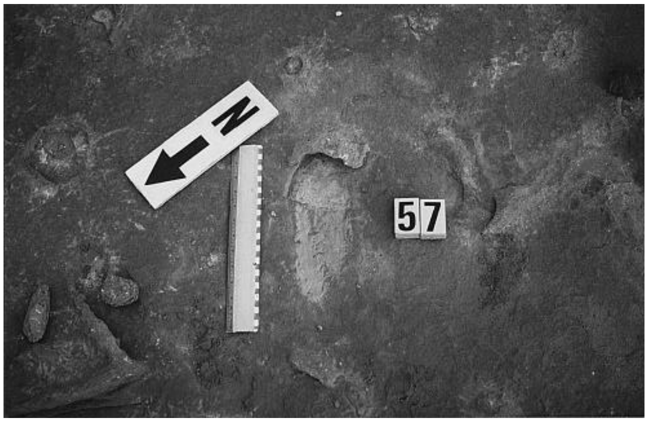

Figure 24. Track 57 has some topographic relief at its front end, but the rear is revealed only by a calcite coloration covering the interior surface. This condition is similar to that of some humanoid and dinosaur tracks along the Paluxy River near Glen Rose, Texas (Morris, 1980, p. 33; Helfinstone, 1994, p. 20).

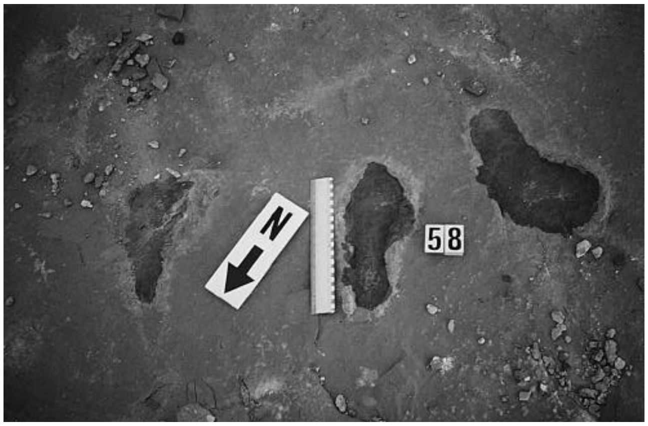

Figure 25. Quasihuman ichnite 58 in the center, flanked by two unmapped tracks, all enhanced with water.

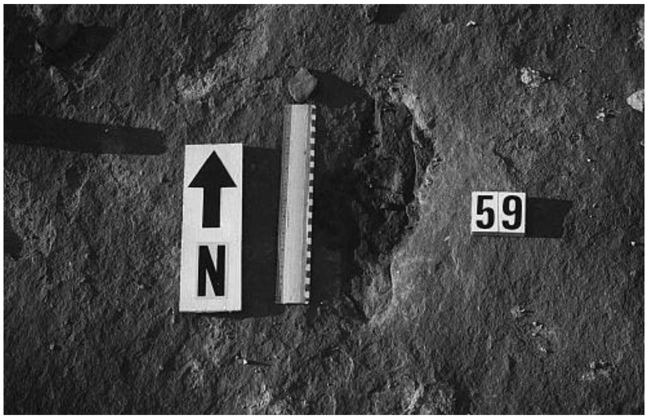

Figure 26. Putative shoe print 59 with sharp lines, enhanced with water, in stride with two elongate depressions.

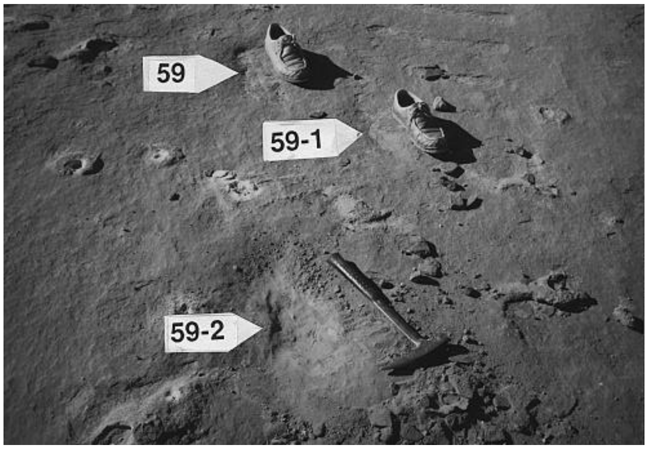

Figure 27. A high angle shot of tracks 59, 59-1 and 59-2, a partial trackway facing south, with the tracks coming toward you.

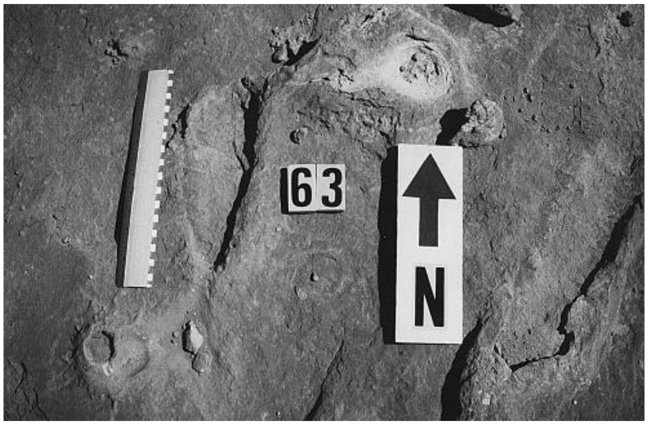

Figure 28. Isolated humanoid ichnite 63 surrounded by nodules.

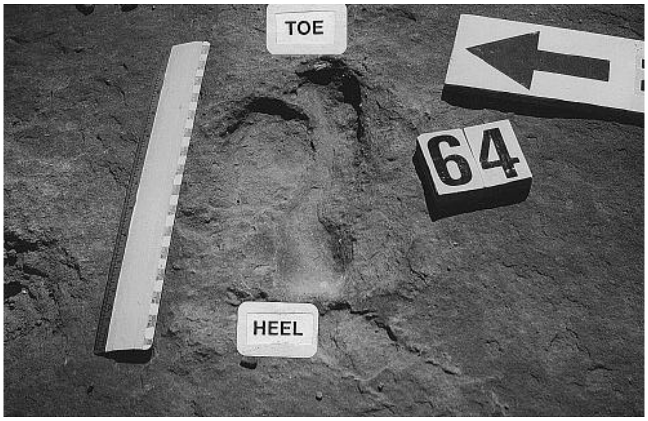

Figure 29. Child-size overlapping tracks 64, with clear arch in the track on the right. It is unlikely a nodule would form inside another nodule to produce this effect. Arrow points north.

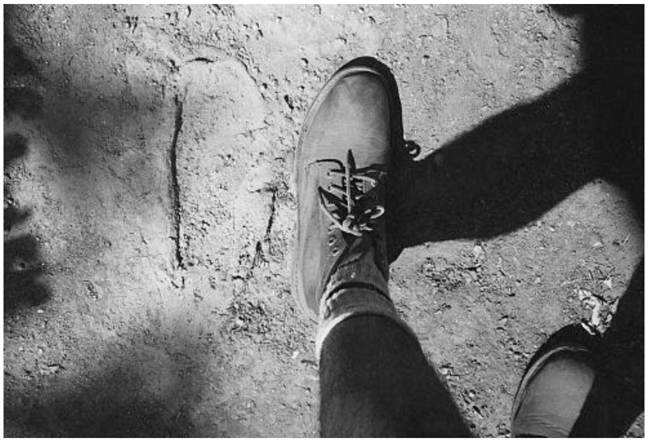

Figure 30. Contemporary track a week old, in surficially softened mud which hardened.

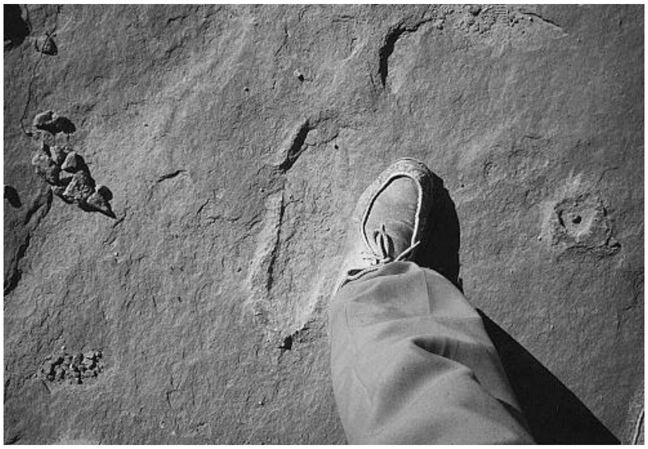

Figure 31. An unmapped isolated quasihuman ichnofossil on a mound at Site 2.

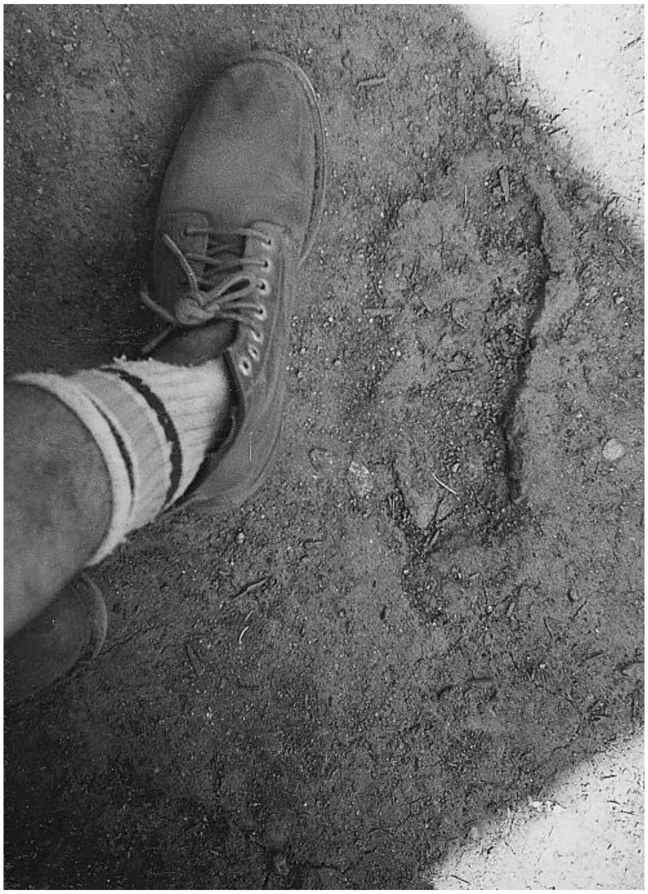

Figure 32. Another contemporary track made at the same time as that of Figure 30.

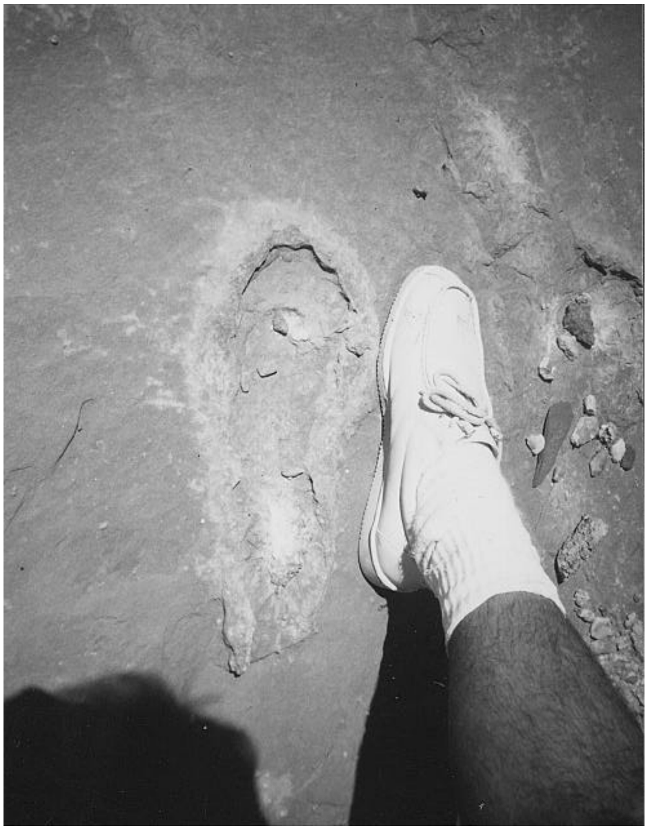

Figure 33. One of three quasihuman ichnofossils we identified together as Track 58.

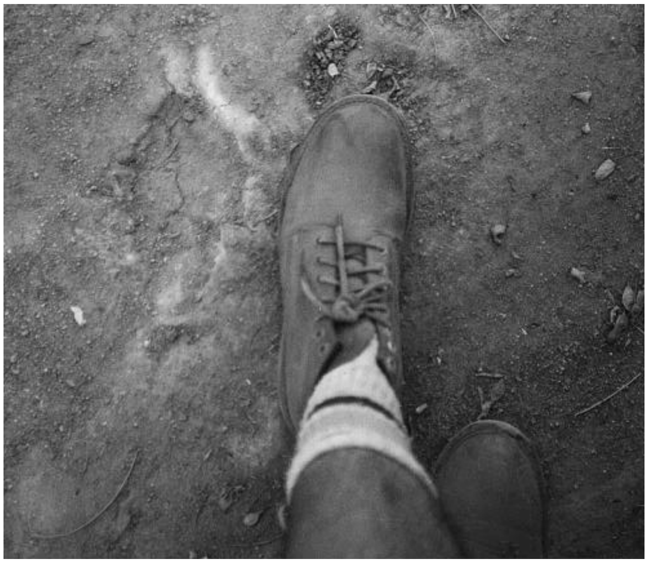

Figure 34. Week-old contemporary track.

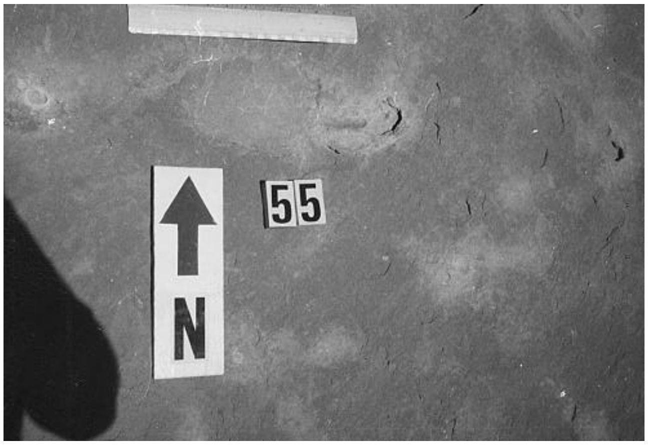

Figure 35. Track 55, the quasihuman ichnofossil closest in distance to a tridactyl dinosaur-like ichnite. See also figures 22 and 23.

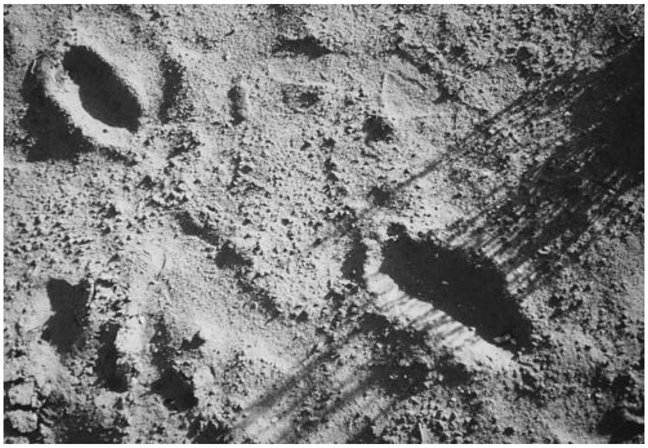
Figure 36. Tracks made by a Navajo in loose wet sand in a wash several meters south of Site 2.

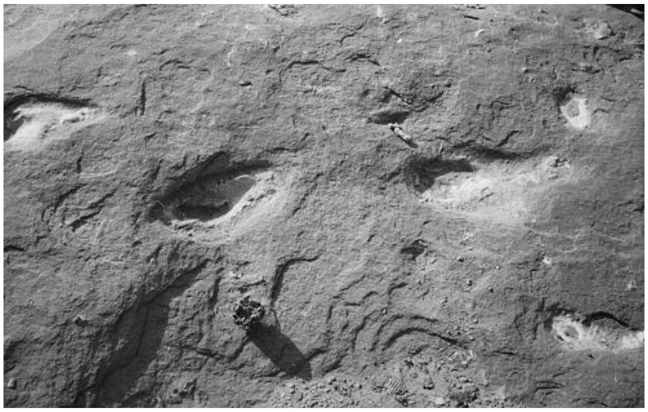
Figure 37. Trackway of unmapped quasihuman ichnofossils several meters east of track 39. Notice all face the same direction, unlike random nodule impressions.

LETTER TO THE EDITOR

Deep Dwelling Bacteria

It seems that someone should have a field day from the creationist viewpoint, by reviewing the article called "Deep Dwellers" in *Science News,* March 29, 1997 (Monastersky, 1997). The article describes bacteria trapped 2.7 kilometers below the ground and possibly 3.5 kilometers or more. The bacteria are 10 times larger than the pores in the rock, meaning bacteria cannot make their way into the rock and neither can they make their way out. The article says "The organisms survive by living on a spare diet of petroleum and other organic compounds dissolved in the groundwater. Because these nutrients are so dilute, the microbial colonies do not receive enough food to grow or reproduce, nor do they have room to spread through the rock. They simply live in a sort of suspended animation." (Monastersky, 1997, p. 193). The article also says these are "anaerobic organisms which die when exposed to oxygen" (p. 192).

Is not that amazing! Since they cannot get in or out, it would seem not to matter if they were created/evolved 10 years ago, 6000 years ago, 80 to 160 million years ago (as the article suggests), or 1000 zillion years ago. Furthermore, it would seem they could not have been trapped or untrapped in the past because oxygen would have killed them. If you accept evolution, it follows that they all would have evolved with the ability to survive indefinitely and independently, and yet they all would appear to be virtual copies of one another! Mother Grimm's Fairy tales are becoming more credible all the time (especially if time includes millions of years)!

Reference

Monastersky, Richard. 1997. Microbes thrive far below the ground. *Science News* 151:192-193.

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On Kingdom Science

When God's own children stay at lab
or in the fields to work with skill,
their fresh devotion spent so that
their minds with science fill;
this pleases One who six days toiled
and then pronounced His own work "good"-
Father, Spirit, Sacred Son
well made that flesh and wood.

When faithful folk with scale or scope
probe God's good work of plant or stone,
they worship and see facets of
His mind - elsewhere unknown.
Between research and Scripture true
no conflict final does endure,
For Christians find from Nature's lore
God's written Word is sure.

No eagle flies, no lily blooms
outside His watchful eye and care;
yet Solomon full well arrayed
was not at all so fair.
So let us cast our widow's mite
of scientific thoughts full run,
and we will thrill at last to stand
and hear Him say "Well done!"

George F. Howe

AN UNCONFORMITY BOUNDARY EXPOSED AT THE LOWER TORNILLO CREEK BRIDGE, BIG BEND NATIONAL PARK, BREWSTER COUNTY, TEXAS, U.S.A.

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Abstract

*An outcrop along lower Tornillo Creek provides an unconformity contact between the San Vincente Member of the Boquillas Formation and the overlying Pen Formation. This contact marks the depositional boundary between the former North American epeiric seaway (actually retreating Floodwater) and subaqueous caldera erupted sediments derived from the Trans-Pecos Texas region. A source for the Pen Formation sediments along with a mechanism for mixing the marine fossils found within it is proposed within the framework **of** the Young-Earth Flood Model.*

Introduction

Much work has been conducted in Big Bend National Park in an effort to interpret the physical evidence (i.e., sediments, fossils, and volcanic features) within the framework of the Young-Earth Flood Model (e.g., Williams and Howe, 1993; Williams, Matzko, Howe, White, and Stark, 1993; Williams, 1993a, 1993b; Froede, 1995a, 1995b, 1996). The Park provides many interesting geologic exposures which span the Mesozoic (i.e., Late Cretaceous) to Holocene. This paper explains the lower Tornillo Creek area strata (i.e., sediments and fossils) within a creationist geological timescale (Froede, 1995c).

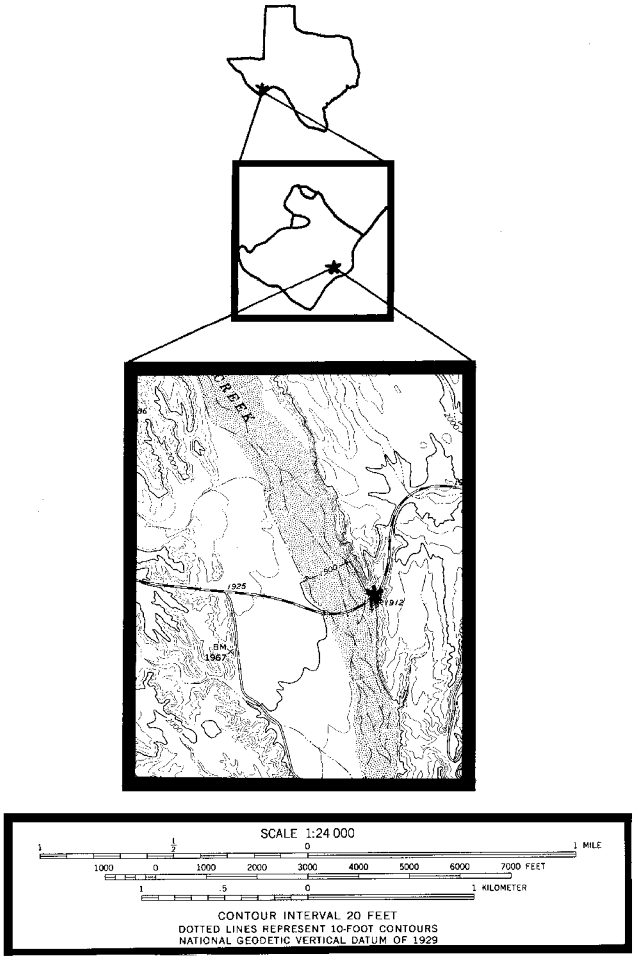
Site Location

The site of interest is located on the northeastern side of the Tornillo Creek Bridge (Figure 1). This particular exposure contains an interesting contact between the San Vincente Member (Mbr) of the Boquillas Formation (Fm) and the overlying Pen Fm [Maxwell, Lonsdale, Hazzard, and Wilson, 1967, p. 30]. For many localities the San Vincente Mbr grades upward into the Pen Fm, while at others the contact is abrupt (Maxwell et al., 1967, p. 67). This specific locale reflects an abrupt contact (i.e., unconformity). Both of these stratigraphic units are regarded by Uniformitarians as being Upper Cretaceous due to the fossils which they contain (reflecting circular reasoning-see Froede, 1994).

Site Stratigraphy

The Cretaceous age deposits in the Park, are viewed as reflecting the transition from a warm shallow epeiric seaway to terrestrial surfaces where the dinosaurs roamed (these environmental changes supposedly occurred over the course of millions of years during the Late Cretaceous). A Young-Earth creationist interpretation of the epeiric sea as regressing Floodwater is presented in Froede (1995d).

The difference between the San Vincente Mbr and the overlying Pen Fm is recognized as being both lithological and paleontological** (Figure 2). The two stratigraphic units have been investigated and described by Maxwell et al., (1967) as:


CREEK
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BM 1967
SCALE 1:24 000
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1 .5 0 1 KILOMETER
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 1. Expanded location map showing Texas, Big Bend National Park, and the Lower Tornillo Creek Bridge location.

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**The paleontological tools identified as "Inoceramus" and "Exogyra" are varieties of oysters which were present during the Cretaceous but have since become extinct. They are recognized as "index fossils" and are key to the identification and dating of strata based on the uniformitarian concept of biostratigraphy.

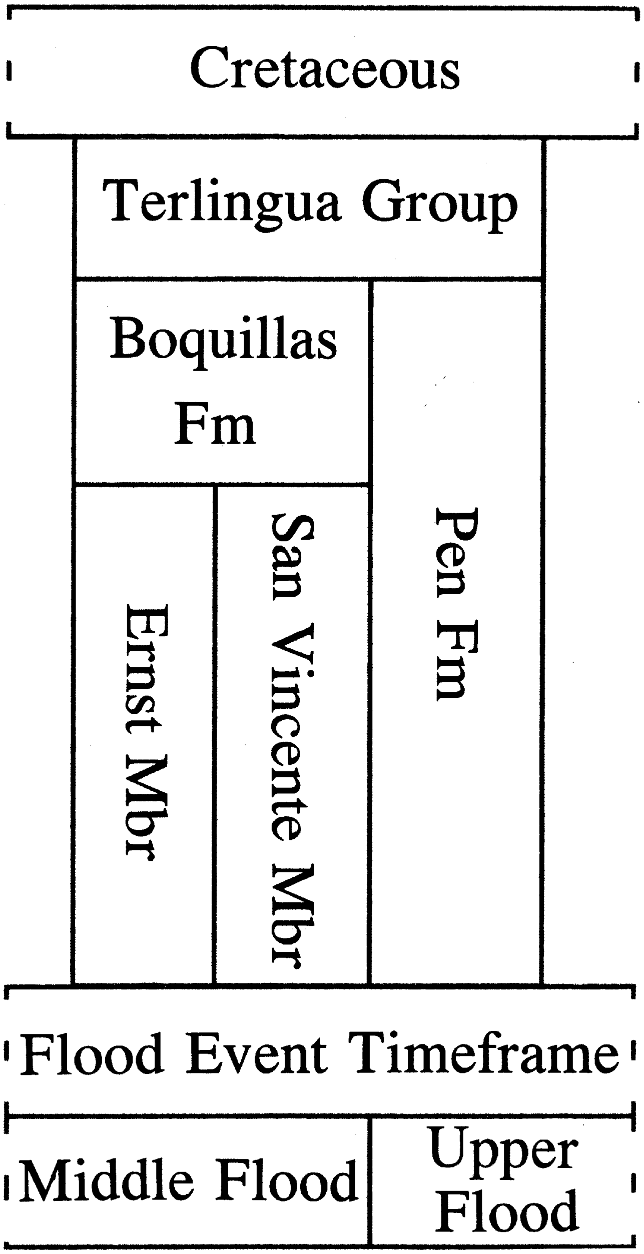

Figure 2. A generalized uniformitarian stratigraphic column (modified and redrawn from Runkel, 1989, p. 124, Figure 3) compared to a proposed generalized creationist stratigraphic column (Froede, 1995c). The boundary separating the Middle and Upper Flood Divisions should be located at this point due to overlying Aguja and Javelina Fm deposits exhibited in other sections of the Park.

Boquillas Formation

San Vincente Member-The member is mostly 350 to 400 feet thick but thins in some places to 130 feet. It is composed of gray, thin- to medium-bedded, chalky and argillaceous limestone flags interbedded with gray or yellowish-gray platy marl or soft gray marl. The amount of flagstone decreases upward, and the top of the member is alternating soft gray marl and chalk. A chalky ledge (usually a low cuesta) 15 to 20 feet below the top of the San Vincente contains abundant *Inoceramus undulatoplicatus.* Above the *Inoceramus undulatoplicatus* beds, as much as 22 feet of gray marl, slightly indurated, with some flagstone, contain numerous large *Inoceramus* sp. In most localities the San Vincente grades upward into the Pen Formation, but in places the contact is abrupt. At several places, especially in the Terlingua area, the uppermost San Vincente Member is shaly, slightly sandy, and dark gray. These dark beds are slightly more resistant to erosion than the gray-white chalk and weather into lenticular mounds, 10 to 20 feet in diameter and 5 to 6 feet high (pp. 64-67). [Figures 3, 4, and 5 illustrate this description]

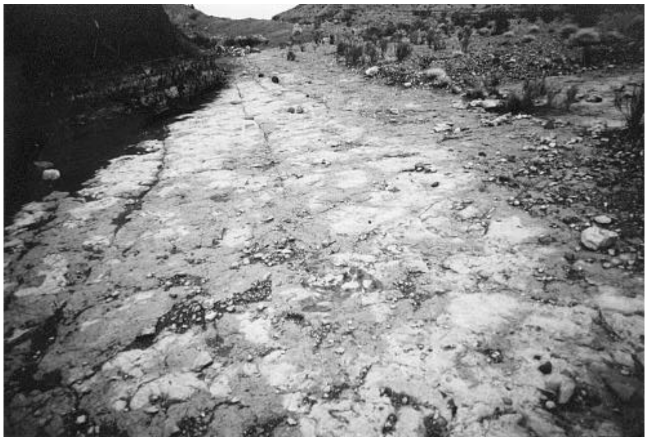

Figure 3. The eroded top surface of the San Vincente Mbr. Cracks form along joints which run parallel to Tornillo Creek. In the approximate lower center portion of the picture there is the remains of a large weathered *Inoceramus* sp. (dark area is shell-light area is limestone)

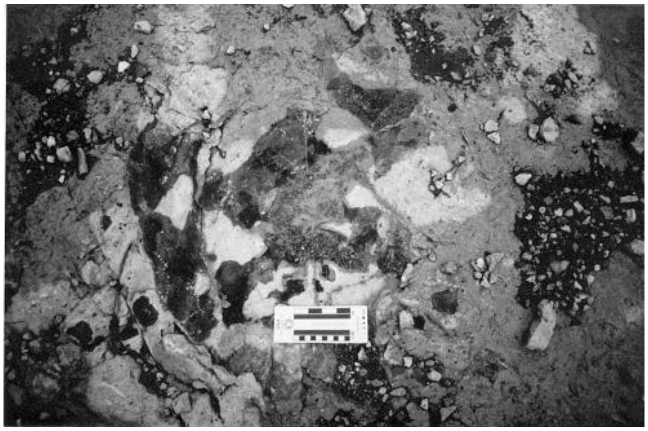

Figure 4. A weathered *Inoceramus* sp. along the top surface of the San Vincente Mbr. The small circular features on the shell are rasping holes created by one or more boring organisms (e.g., sponge, worms, algae, and/or other mollusks) [dark area is shell-light area is limestone]. These features. indicate age and require a once living creature to have lived for a period of time. Hence, this creature was living in the North American epeiric seaway and was washed into the Big Bend area and buried under volcaniclastic sediments during the Middle to Upper Flood Event Divisions.

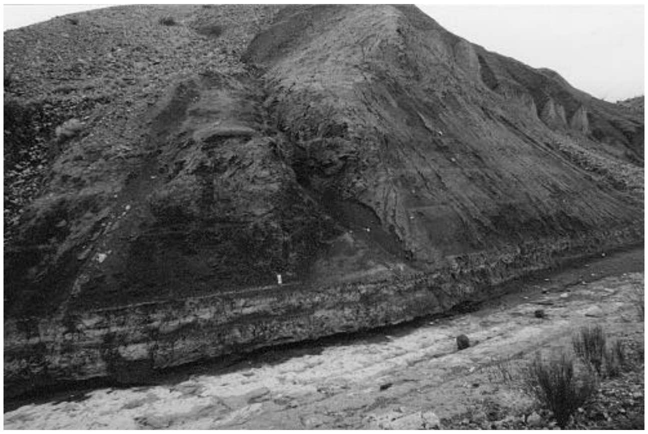

Figure 5. Abrupt contact between the Pen Fm (gray to black clays) and the underlying San Vincente Mbr (white to light gray limestone). Scale in center of picture is 6.5 inches long. Note the calcareous clay transition just above the massive limestone contact. This transition zone weathers at the same rate as the Pen Fm. These lighter clays were derived from sediments transported from the submerged North American interior.

> Pen Formation - The Pen Formation is 219 to about 700 feet thick in the Park. Although there are many local variations, the Pen Formation generally thickens from **southeast to northwest across the Park.** Its total thickness is readily determined, but because of the extensive alluvial cover, it is usually difficult to determine individual units. The basal 50 feet is normally calcareous clay, light bluish gray, with one inch beds of gray chalk. Above this is yellow clay with scattered sandy beds in which some concretions are in beds and others are irregularly distributed. The formation is soft and less resistant to erosion than either the San Vincente below or the Aguja above, and it forms a belt of low topography. Badlands occur in some places, but where indurated terrace gravels cap the clay, the formation stands in steep-faced slopes and some of its unprotected surfaces are low and are subject to sheet wash (pp. 71-73, 78). [Figures 5, 6, and 7 illustrate this description].
>
> Concretions are common throughout, most of which are calcareous, although some are clay-ironstone. Most of the concretions are disc-shaped and are as much as 4 feet in diameter. Most of them are scattered in the clay, but some form layers which extend for several miles. Many of the concretions are cracked and filled with siltstone or thin bands of dark calcite. Layers with numerous concentrations are mostly sandy, and commonly the concretions are encrusted by sandstone.
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> Of the fossils common to the Pen Formation, *Exogyra ponderosa* is the most abundant.*** It ranges from the base of the formation into the Aguja. It is especially abundant in the concretionary beds, and at one place in the north bank of Tornillo Creek, about a mile above the lower bridge, it is an important rock constituent in a 10-foot interval. (boldface mine)

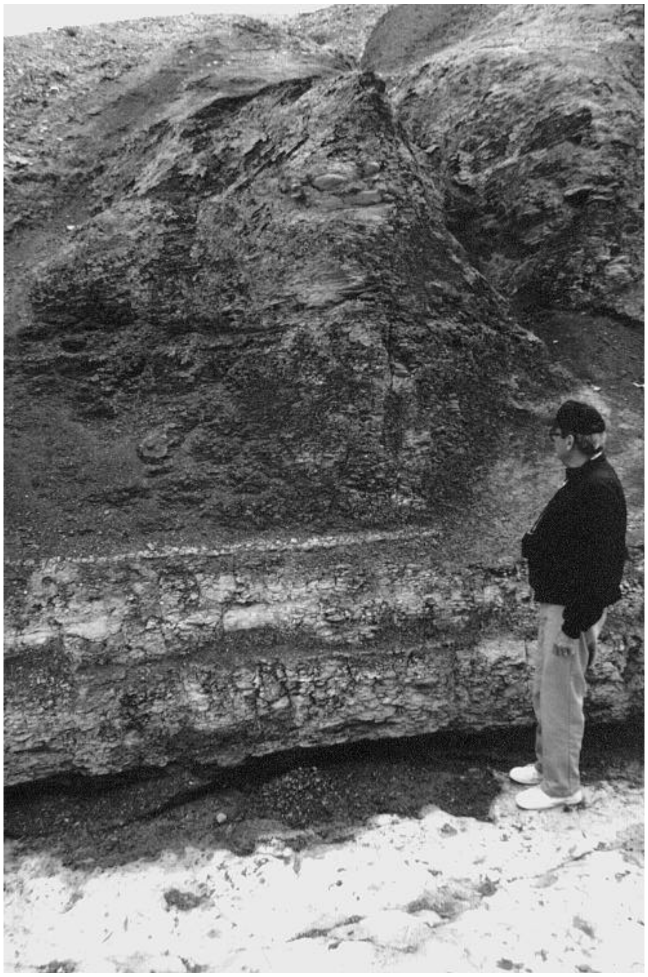

Figure 6. Contact between the San Vincente Mbr and the overlying Pen Fm. Note concretions at several layers along with distinct light clay layers. Undercutting of the soft Pen Fm clay is accomplished as surface waters drain from the sloped San Vincente Mbr toward Tornillo Creek.

What is interpreted to be a conformable contact between the San Vincente Mbr (Boquillas Fm) and the overlying Pen Fm is commonly placed at the top of the progressively thinner bedded limestone which contains very large Inoceramus invertebrate shells (Maxwell et al., 1967, p. 75; Scheubel and Mruk, 1994, p. 29; Stevens and Stevens, 1989a, p. 24). However, many outcrops of this specific type of contact are not so easily discernible. According to Stevens and Stevens (1989a, p. 24):

> The *I. undulatoplicatus* Zone occurs at Chisos Pen east of Terlingua and north of the Chisos Mountains, but not in the Terlingua area; however, there is a widespread thin-bedded limestone unit . . . This limestone contains

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***Many other invertebrate fossils are found in the Pen Fm, including gastropods, ammonites, and pelecypods. A comprehensive listing can be found in Maxwell et al., (1967, p. 78).

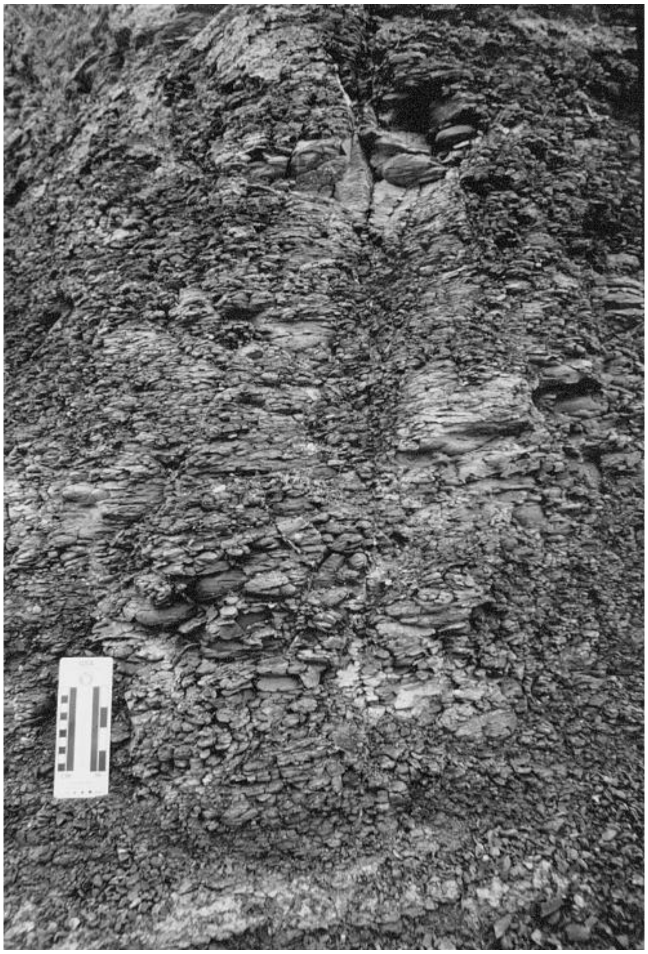

Figure 7. Closeup of the massive clays of the Pen Fm. Both vertical and horizontal joints were noted. Scale is in inches (right) and centimeters (left).

> possible *I. platinus* and **storm generated shell fragment rudstones.** Lehman (1985) placed the *I. platinus* Zone within the Pen Formation near the base. (emphasis mine)

Due to the variation in both the lithologic and paleontologic materials associated with the "type conformable contact" between the San Vincente Mbr and the Pen Fm, the exact boundary is in many locations speculative. More importantly: **The nature of the contact is based on the paleontology, not on the change in lithology.** Limitations in the lateral extent of these specific strata also serve to poorly define this contact.

Paleoenvironments

The San Vincente Mbr of the Boquillas Fm reflects a marine depositional environment, due to both its lithologic (i.e., calcareous clay and marl) units and marine invertebrate fossils (see Maxwell et al., 1967, pp. 70-71). This stratigraphic member is suggestive of the epeiric seaway (i.e., retreating Floodwaters) marine environment. The cyclical nature of some of the calcareous layers containing a mixed variety of invertebrates in non-life position interbedded with calcareous marl is suggestive of storm event deposition (Einsele, 1992, p. 309). However, others suggest that it reflects Milankovitch cycles**** and diagenetic alteration (Einsele and Ricken, 1991; Stevens, and Stevens, 1989a, p. 24).

The Pen Fm is in total contrast, both lithologically and paleontologically, to the underlying San Vincente Mbr. Maxwell et al., (1967, p. 96) suggested that the differences in the lithology between the Pen and San Vincente reflect:

> . . . tectonic movements (which) began as early as the time of deposition of the San Vincente Formation [sic] and increased in intensity and magnitude to the end of the epoch . . . The pre-Tertiary surface was progressively overlapped by the Tertiary rocks from **southeast to northwest across the Park.** (parenthesis and emphases mine)

Lehman (1986, pp. 108-109) proposed:

> Deposits of Cenomanian through Campanian age (Cretaceous) record the gradual filling of the Chihuahua Trough and inundation of the Coahuila Platform with terrigenous sediment derived through erosion of subduction-related volcanic rocks in Sonora. In Maastrichtian (Upper Cretaceous) time, deformation in the Chihuahua Tectonic Belt to the west, and in the Del Norte-Santiago-Del Carmen Uplift to the east, restricted sedimentation to the intervening region -the Tornillo Basin. **Sediment was derived through erosion of surrounding Upper Cretaceous and Lower Cretaceous sedimentary rocks, and perhaps from nearby volcanic rocks in New Mexico and Arizona.** (parenthesis and emphasis mine)

Currently, uniformitarian scientists accept the transport of sediments and fossils from adjacent portions of the North American continent into the Big Bend region.

A Subaqueous Volcanic Source Alternative

It is proposed that the Pen Fm represents some of the first volcanic deposits generated subaqueously from calderas erupting, within the Trans-Pecos region (see Froede 1995b, 1996). However, the Pen Fm is viewed as "Cretaceous" by the fossils contained within its sediments; hence, it does not correspond directly with any known volcanic sources. Presently, the volcanic sediments and strata observed across the Park date to the "early Tertiary" using radiometric methods (see Henry, Price, Parker, and Wolff, 1989; Price, Henry, Parker, and Barker, 1986). Thus it would appear that a volcanic origin for the Cretaceous Pen Fm would predate the currently recognized Tertiary volcanic sources and resulting

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****An excellent Young-Earth creationist critical review of the concepts relating to the Milankovitch Cycle can be found in Oard, 1984.

sediments. The author's interpretation creates serious problems from the standpoint of maintaining the uniformitarian stratigraphic timescale - or does it?

According to Maxwell et al., (1967, p. 300) the first volcanic activity recorded in the strata around Big Bend: ". . occurred in the Boquillas Formation where in some places thin, ashy clay layers are interbedded with the flagstone. Bentonitic clay layers are present in the Pen Formation . . ."

The bentonitic clay layers present in the Pen Formation represent the remains of a volcanic ash (see Williams and Howe, 1993) which was erupted in a marine environment and subsequently altered (for more information about bentonite clay being derived from volcanic ash see: Carozzi, 1993, pp. 93-95; Charnley, 1989, pp. 411-414; Fisher and Schmincke, 1984, pp. 336-340; Grim, 1968, pp. 566-570; Williams, Turner, and Gilbert, 1982, pp. 272-274).

Thus we have evidence to suggest that volcanic input was supplied to the area during the "Late Cretaceous." The next issue to be resolved is the source area for those volcanic layers. Were the original ash falls from distant volcanic eruptions (presently unidentified) or were they possibly locally derived? Again we turn to Maxwell et al., (1967, p.300), where they state:

> Tabular igneous bodies intruded the Pen and Aguja Formations on the west side of Mariscal Mountain and the Aguja Formation at the Cow Heaven anticline and Tortuga Mountain dome. These were probably emplaced during Late Cretaceous time and were folded concordantly in structures during the Laramide orogeny. Sills in the Boquillas crop out along the west side of the Sierra del Carmen and on Mesa de Anguila; they were probably also emplaced during Late Cretaceous time.

Price and Henry (1994, p. 221) documented the occurrence of igneous dikes (i.e., rhyolitic and basaltic) in and around the Big Bend National Park, some which are dated to the Late Cretaceous. Additionally, Lehman (1986) discussed the input of volcaniclastics into the Trans-Pecos region during the Late Cretaceous. Thus we now have evidences of igneous activity (locally derived) which could account for the volcanic sediments currently comprising the recognized "volcanic" layers of the Boquillas and Pen Formations. However, large-scale Late Cretaceous volcanic source areas have not yet been identified within the Big Bend/Trans-Pecos area. It is suggested that these Late Cretaceous volcanic sources are simply buried too deeply under their own volcanic sediments to be properly identified (see Froede, 1996). It is further proposed that subaqueously generated volcaniclastics (i.e., Pen Fm sediments) initially were deposited somewhat radially around the submerged erupting calderas from which they were derived. Regionally, these Pen Fm volcaniclastic deposits lie in the same direction as the much later Tertiary volcaniclastics (both groups of strata exist in a southeast to northwest trend).

Discussion

The Pen Fm contains invertebrate fossils which suggest a marine environment and would require a subaqueous setting. The fact that the Pen Fm is found, at some places, interbedded with the San Vincente Mbr suggests that the volcanic eruptions occurred while the epeiric seaway covered the region. The fossils serve to "date" the Pen Fm to the Late Cretaceous. Where the top of the San Vincente Mbr was possibly eroded (i.e., channels formed due to tidal action and/or water current scouring associated with the movement/draining of the Flood waters), the overlying Pen Fm would lie unconformably on top of the previously eroded San Vincente Mbr and would not "grade" into it. The author suggests that this is the case for the contact exhibited at the Lower Tornillo Creek Bridge (Figure 8). It is further believed that the fossils found in the Pen Fm were derived

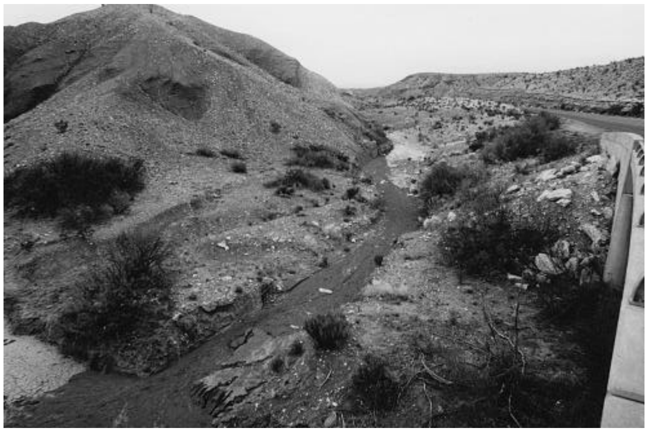

Figure 8. Unconformable contact at this locale between the massive Pen Fm (left side-dark colored clays) and the adjacent/underlying San Vincente Mbr (right side-light colored rock). Note the layering of the San Vincente exposed along the road.

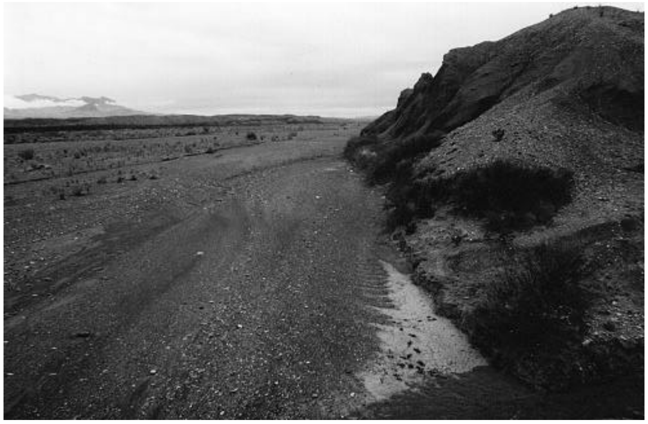

Figure 9. Tornillo Creek looking north. The San Vincente limestone outcrops at the base of the Pen Fm (light colored area). Again this contact is clearly not conformable and suggests the emplacement of the Pen Fm following the deposition of the San Vincente Mbr. Note gravel deposits and brecciated rocks (i.e., volcanic and non-volcanic) cover the top surface of the Pen Fm.

from the North American continent as the Floodwaters moved across it. Water movement was caused by both tectonic forces and withdrawal of the sea into the adjacent ocean basins. Sedimentary conditions associated with this time frame resulted in the erosion and transport of the various invertebrate fossils, from shallower marine environments on the North American interior, toward the south into the freshly erupted Pen Fm. Fossils were mixed within the Pen Fm as it was being deposited and reworked by these water currents (e.g., Barnette and Baumgardner, 1994). The rounded concretionary sedimentary features, found within the Pen Fm, provide further evidence of moving water. These rounded sedimentary objects were buried and compressed forming the disk-shaped features observed today.

While the Uniformitarians recognize much of the "Tertiary" volcanically derived sediments as possibly being deposited in an apron around the volcanic sources (see Stevens and Stevens, 1989a, p. 30; Stevens and Stevens, 1989b, p. 93; Walton 1986, pp. 251), no one has suggested that the Cretaceous Pen Fm represents volcanic sediments derived from nearby calderas erupting subaqueously. Again, this is because the "fossils" date the Pen Fm as being older than the currently recognized large-scale eruptions of volcanic rocks found in the Tertiary.

Applications Within The Young-Earth Flood Model

The author suggests that the uniformitarian Upper Cretaceous epeiric seaway reflects the transition from the Middle to Upper Flood Event Timeframe within the Young-Earth Flood Model (Figure 2) [Froede, 1995c]. The San Vincente Mbr of the Boquillas Fm represents the sedimentary conditions of the epeiric seaway created as the Flood waters covered the interior of the North American continent. The Pen Fm is suggested as reflecting some of the first deposits of subaqueously derived volcanic sediments which occurred within the region during the Upper Flood Event Timeframe-see Figure 2.

The Pen Fm reflects altered volcaniclastic sediments. Calcareous intervals in the lower sections of the Pen Fm probably reflect paleosurfaces where waters deposited calcareous sediments derived from the adjacent North American continent due to continental tectonic processes (e.g., the Laramide Orogeny). Along with the calcareous sedimentary input, invertebrate fossils were also supplied resulting in a variation in lithology and paleontology from the underlying San Vincente Mbr.

The fact that the Pen Fm is not consolidated reflects the distance from the heat source from which these deposits were derived. If sufficient heat were available during the initial deposition then these clastic sediments would have been "welded" volcanic units with calcareous layers and fossils found along the tops of each unit. The fact that fossils are found within the Pen Fm indicates that some mixing occurred as the volcaniclastics were deposited below their welding temperature. This reworking would have also served to rapidly alter and break down the volcaniclastic deposits into nondescript clay layers thus removing any obvious physical evidences (e.g., glass shards, welded fragments, etc.) of its volcanic origin.

Conclusions

Fossils within the San Vincente Mbr of the Boquillas Fm are found within alternating calcareous layers and represent possible "storm-event" deposits. This suggests a high-energy time frame which would correlate to the Middle Flood Event Division (Figure 2). The overlying dark clays of the Pen Fm contain a different (i.e., shallower marine) invertebrate faunal assemblage, probably derived from the epeiric seaway fauna on the adjacent North American continent. The Pen Formation deposits would represent the first deposits of the Upper Flood Event Division which mark a change in geologic-energy levels (Froede, 1995c; Reed, Froede, and Bennett, 1996).

The justification for this reasoning is based on the establishment of marine life (as evidenced by fossils) on the North American Continent during the Flood for an uncertain period of time. This environment existed long enough for some marine-life forms to flourish. At some point, while Floodwaters covered this portion of Texas, tectonic processes (still incompletely understood) resulted in the generation of volcanic eruptions in the Trans-Pecos region.

Currently, the uniformitarian model has not addressed the paleoenvironmental setting in which the Pen Fm was deposited (e.g., deep-water shales and the shallow-water fossils which they contain). Additionally, the origin of the Pen Fm remains unresolved. This catastrophic interpretation fits the rock record exposed within this area and supports the time frames suggested by the Young-Earth Flood Model (Froede, 1995c). This Young-Earth Flood Model interpretation supplies a reasonable and defendable position of the contact between the San Vincente Mbr of the Boquillas Fm and the overlying Pen Fm as found at the Lower Tornillo River Bridge.

Acknowledgements

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Quote - Fourteenth Century Europe's Worldview

From *A Distant Mirror* by Barbara W. Tuchman. 1978. Knopf. New York. A history of the fourteenth century in Europe.

Writing of the difficulties a historian experiences in attempting to chronicle a time so distant from our own, Ms. Tuchman states: (Foreword, page xix)

> Difficult of empathy, of genuinely entering into the mental and emotional values of the Middle Ages, is the final obstacle. The main barrier is, I believe, the Christian religion as it then was: the matrix and law of medieval life, omnipresent, indeed compulsory. Its insistent principle that the life of the spirit and of the afterworld was superior to the here and now, to material life on earth, is one that the modern world does not share, no matter how devout some present-day Christians may be. The rupture of this principle and its replacement by *belief in the worth of the individual and of an active life not necessarily focused on God* is, in fact, what created the modern world and ended the Middle Ages. (Emphasis added.)

The author possibly sees "the rupture of this principle" and the resulting ascendancy of humanism as a benefit. Christians will see the rupture as the *source* of modern societal ills, and of the decline of Western civilization.

AN EXAMINATION OF THE ASSUMPTIONS OF "EDEN'S GEOGRAPHY ERODES FLOOD GEOLOGY"

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Abstract

In "Eden's Geography Erodes Flood Geology" (The Westminster Theological Journal, *Spring, 1996, pp. 123-154), John C. Munday argues that a cataclysmic view of a world-wide Flood cannot be supported after an analysis of the geography of Eden. Munday bases his argument on two unproven assumptions: 1) Moses was the author of Genesis 2 and 2) the account was written from the perspective of the Israelites living in Canaan around 1500 B.C. These assumptions are invalid. It is more consistent with the data to attribute the account to Adam. He communicated it (possibly orally) from a pre-Flood perspective. Moses used Adam's account (unchanged) when compiling Genesis. The geographical terms in Genesis 2 are generic. They are not specific to any location, and could have been used for both pre-Flood and post-Flood geographic features. Eden's geography was destroyed by the Flood. Its location cannot be found in a post-Flood setting.*

An article in *The Westminster Theological Journal,* "Eden's Geography Erodes Flood Geology" (Munday, 1996, pp. 123-154), argues that it is difficult to support the cataclysmic view of a world-wide Flood (proposed by expositors such as Henry Morris) after an analysis of the geography of Eden.

> Put briefly, the test is this question: Is Flood geology consistent with the geography of the garden of Eden taken literally (Munday, 1996, p. 125)?
>
> Some weakening of geographic actualism or Flood geology is the logically necessary outcome. Holding to actualism in the garden geography seems the least-forced of the alternatives, but then the negative impact on the Flood geology paradigm is severe (Munday, 1996, p. 154).

The approach of the article is to establish the location of Eden by the references given in Genesis 2, and then to show that the current geology of the proposed location of Eden (the southern Mesopotamian valley near the Persian-Arabian Gulf) does not support the views of those who hold to the world-wide, cataclysmic-Flood view (Munday, 1996, p. 133).

The author, Munday, presents what appears to be a logical argument to lead to his conclusions, and he is clearly very knowledgeable about the geology of the Near Middle East. Although his argument appears convincing on the surface, it would be possible to show that Munday's logic is flawed since he uses an argument based on an invalid dilemma. He presents the alternative that the Bible either is incorrect about the geography of Eden or about the extent of the Flood. This position is both logically and theologically invalid.

Another way to demonstrate the weakness of Munday's conclusions is to examine the assumptions on which he bases his argument. If these assumptions are not correct, which I will show, then whether or not his logic is correct, his conclusions are unsupported. The purpose of this essay is to examine the assumptions on which he bases his argument, not to challenge his methodology, logic, or knowledge of geology, because he is clearly mistaken in his assumptions, whereas in the latter his errors are not as evident.

Moses as the Author of Genesis Two

The first assumption of Munday is that Moses wrote Genesis 2. He says: "Based on the Bible's own witness, Moses wrote Genesis two and the rest of the Pentateuch" (Munday, 1996, p. 126).

Munday demonstrates Mosaic authorship by pointing to various OT and NT passages which refer to Moses as the author of the Pentateuch. Liberals might dispute that Moses composed the book of Genesis in its final form, but few conservative theologians would. However, to say that Moses is the author of Genesis 2 does not tell the whole story. Moses is also the author of Deuteronomy, but it is likely the case that he did not write the final chapter about his own death. It is possible, of course, that he did write it prophetically; but it is more natural to believe that Joshua or Eleazar wrote this portion of the book. So, although Moses is the author of the Pentateuch, he may not have written every word in it.

The book of Psalms has often been attributed to David. This does not mean that he wrote every word in the Psalter. In fact a major portion of the collection was written by Asaph, Moses, and others. Yet, because David is the principle author of the core-portion of the Psalms he is often attributed with the general authorship of the collection. In a similar way, Moses may be attributed with the authorship of the Pentateuch; and yet portions of it may be from the hands of other authors.

Luke is undisputedly the author of the Gospel of Luke. Yet, he tells us that he used sources for compiling his work

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(Lk 1:1-2). In a similar way it is quite possible that Moses also used sources for his work.

Munday does acknowledge at the end of the paragraph in which he states that Moses was the author of the Pentateuch that “Moses may have relied on earlier historical records (both oral and written), and interpolations were probably made after him by copyists (Munday, 1996, p. 127).” He then draws his conclusion - “Based on this view, it may be surmised that the obvious audience of Genesis 2 was the early Israelite community and any who followed later” (Munday, 1996, p. 127).

Munday has started with an unproved assumption by stating that Moses wrote Genesis 2 for his contemporary audience. He acknowledges that Moses may have used source material. But this is far different from showing that Genesis 2 is in fact the words of Moses and not the words of the source author. If Moses did not write Genesis 2, but only copied it from an earlier writing, or wrote it down from oral tradition, then it may not have been written for the “early Israelite community.” Before Munday can jump to his conclusion, he must demonstrate that Moses actually composed the words for his audience.

In this regard, Roland K. Harrison states:

> There may well be quite a number of sources designated in the Old Testament writings which have not actually been recognized as such by most modern scholars. Genesis appears to be a case in point, with the clue to the underlying sources being provided, not by the incidence of the divine names or the presence of supposed duplicate narratives, but by the phrase translated "these are the generations of" (Harrison, 1969, p. 543).

The exact meaning of the word תולדת *(toledoth)* has been hard to determine. The NIV usually translates it “this is the written account of.” By using these words, the translators of the NIV communicate the view that there were written sources that Moses used to compile the book of Genesis. Harrison notes further that Genesis 5:l uses the word ספר, which can be translated as ‘scroll’ or ‘book’ and can only be a reference to a written record, presumably on clay tablets (Harrison, 1969, p. 547).

Harrison indicates that it appears to have been standard practice for communications in the ancient Near East to commence with a title and end with a colophon which could contain the identity of the scribe. In longer communications that covered more than one tablet, the sequence of the tablets and the flow of the narrative were indicated by repeating the first few words of the following tablet on the previous tablet. It appears that the use of תולדת falls into this category (Harrison, 1969, p. 544).

Harrison concludes that Genesis 1:1-37:2 was composed from a number of literary sources (Harrison, 1969, p. 548). He also says: “What is evident, however, is that the principal facts concerning the individual in question have been recorded *before* the incidence of the phrase in question, and that they are not recorded after its occurrence” (Harrison, 1969, p. 545). Based on this observation, Genesis 5:1 seems to indicate that what preceded (Gen 1:1 through 4:26), was the account written, dictated or orally communicated to others by Adam (Harrison, 1969, p. 545). Harrison notes that the use of תולדת in Genesis 2:4 is only appropriate as a concluding sentence (Harrison, 1969, p. 546) and suggests that the use of תולדת refers to the owner of the tablet or “the history written or possessed by ...” (Harrison, 1969, p. 547).

These observations by Harrison [and at least one other writer, for example Wiseman (1977)], seem to indicate that a major portion of the book of Genesis was not in fact composed by Moses, but by others, including Adam (whether written or handed down orally). This in no way undermines the fact that Moses was the compiler of these writings into the narrative which we now have as the book of Genesis.

Other writers [for example (Blocher, 1984, p. 30) and (Kidner, 1967, pp. 22-26)] disagree with Harrison about the interpretation of תולדת and feel that it should be interpreted as a heading. Regardless, Munday has not dealt with the possibility that Moses did not write Genesis 2, but copied it from an earlier writing.[1]

If in fact Adam was the ‘author’ (even if handed down orally) of the first portion of the book of Genesis, then Munday’s assumption that Moses wrote Genesis 2 is not correct. If his first assumption is not correct, his second assumption, which rests on it, is very difficult to accept.

A Mosaic Audience for Genesis 2

The second assumption of Munday is that the audience of Genesis 2 was the Israelites for whom Moses wrote the book of Genesis. He states:

> Based on this view, it may be surmised that the obvious audience of Genesis 2 was the early Israelite community and any who followed later. The point of interest here is that Moses communicated to a post-Flood audience; hence, his description of the pre-Flood garden location was apparently intended to be meaningful in terms of a post-Flood landscape. It was plainly implied that the post-Flood landscape had real correspondence

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[1] There are many who claim that we cannot accept as complete, or literal, the genealogies in Genesis 5 (Munday says that they are not complete, see page 133, especially footnote 37). But if we accept the Genesis account at face value, Adam could have handed down orally the account of creation to one of his descendants (e.g., Methuselah), who in turn could have told the account to Shem (Shem was about 100 years old at the time of the Flood, and Methuselah died in the year of the Flood). Shem lived 500 years after the Flood (Gen 11:10, 11) until the time of Jacob. Oral transmission would only have had to pass through one intermediary from Adam to Shem. Shem could have dictated the account to provide a written record. Abram could have taken the written record with him to Palestine.

> with the pre-Flood landscape, and that this correspondence was sufficiently close to permit the audience to generally understand the garden location (Munday, 1996, p. 127).

> While Wright allowed that "eastward" might refer to the eastern portion of Eden, and Lemaire pointed out that in Hebrew "eastward" can refer to the temporal past, others agree that Eden was eastward of the Hebrew audience. The author(s) of Genesis, whether Moses or later redactors, are held to have resided in Canaan, even if the outline and elements of the garden story owed their origin to Sumerian sources. Hence, it is concluded that Eden was east of Canaan (Munday, 1996, p. 134).

> [T]he story's audience was intended to comprehend the garden's geography. Both proposed datings are post-Flood; therefore, a post-Flood audience was intended to understand a pre-Flood location (Munday, 1996, p. 130).

However if the author of Genesis 2 was Adam, then he, rather than Moses, wrote (or related the account) for his contemporary audience. It is of course possible that Moses changed the names related to Eden's geography to contemporary names when he incorporated Adam's account into Genesis.

There are four considerations which make it likely that the Genesis 2 passage was written (or told) from Adam's perspective, not Moses'; and therefore we should not expect to find the geography of Eden understandable after the Flood.

1) Names are Generic and Could Easily be Reused

Munday considers the possibility that the names for pre-Flood geographic features were remembered and re-used after the Flood. So, for example, there may have been a river named פרת before the Flood and one given the same name after the Flood. However, Munday dismisses this idea (and in particular, the remarks of Morris who suggests this idea in his commentary) by saying: "If renaming has occurred in Gen 2:10-14, it would be appropriate to look for specific evidence of geographical renaming elsewhere in Scripture" (Munday, 1996, p. 152).

There is! There are clear instances in the Bible of place names being used for more than one geographic location, and in some instances for three different locations - for example: Eden (Gen 2:10; Ezk 27:23), Cush (Gen 2:13; Ezek 29:10), Asshur (Gen 10:l1[2]; Gen 25:18) Kadesh (Josh 12:22; 15:23; 20:7; 21:28 [compare I Chron 6:72]), Goshen (Gen 47:6; Josh 10:41; 15:51), and Zanoah (Josh 15:34; Neh 3:13; 11:30; Josh 15:56; 1 Chron 4:18). But Munday would probably not accept this, as he would want a specific instance in Scripture of a "geographical place name being applied to a new location because the earlier site had been lost, destroyed, or forgotten" (Munday, 1996, p. 153).

It could be argued that the Flood was a unique event and that Noah and his sons attempted to maintain some continuity from the pre-Flood world to the post-Flood world by using names for rivers and locales that were familiar to them. This could have been the case especially if the geographic features reminded them of the pre-Flood geography. This is not an unheard of phenomenon. In Ontario, where I live, one finds a London, Cambridge, and Waterloo, and dozens of other towns and geographic features named after the settlers' locations in Europe.

Whether or not Noah and his sons reused the names themselves is really not the important question. The question is can the words themselves support reuse? Two considerations which make this idea plausible are:

- Of the eight location names mentioned in Genesis 2, at least three (Eden, Cush, Asshur) are used for at least two geographic locations. This implies that the names were not specific to any one locale.
- Of the eight locations, all eight are based on generic terms which could be applied to many pre-Flood and post-Flood geographic features.

> The etymological conclusion is that Eden may signify either a place, as in a steppe or a fertile plain, or pleasure (Munday, 1996, p. 136).

> The word **[Pishon** (or Pison or Pihon, פישון)] itself may mean "the gusher" or "to cascade" or "dispersive" (from a root meaning "to spread") (Munday, 1996, p. 137).

> This is consistent with the accepted derivation of the word **Havilah** from a West Semitic root meaning "sand" and hence "land of sand" (Munday, 1996, p. 139).

> The Hebrew גיחון **[Gihon]** derives from a root meaning "to bubble" (Munday, 1996, p. 141).

> **CUSH** (כוש [dark-coloured, first; perh. an *assembly, people brought together*, Ges., 6^{e} Aufl (Hackett, 1876, p. 519 and Fausset, p. 146).]

> This name **[Tigris]** is a modern Greek equivalent of the Persian *Tigras*, Arabic *Dijlat* (or *Diglat*), from the Akkadian *Idiglat* and Sumerian *(I)digna*... The root meaning of Tigris is "arrow," as to "signify a dart, or swiftness" (Munday, 1996, p. 141).

> According to Brown, Driver & Briggs **Asshur** is derived from the root rva = rvy (Brown, 1952, p. 78) which can take meanings such as *good, gracious, happiness, blessedness, straight* (Brown, 1952, pp.78, 80).

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[2] This assumes that Assyria is the same name as Asshur, which Munday appears to accept.

> **Euphrates:** in old Persian, *Ufrâta,* according to *Delitzsch,* or the good and fertile stream: *Ufrâtu,* according to *Spiegler,* or the well-progressing stream (Keil and Delitzsch, 1949, p. 81).

It seems to be clear that the geographic names used in Genesis 2 are so generic that they could be used in many contexts.

Munday dismisses Morris' suggestion that the pre-Flood names were remembered by those who came after the Flood, and says: "No evidence supporting this explanation was provided" (Munday, 1996, p. 152). Morris may not give a satisfactory explanation for the reuse of the names by those who came after the Flood. But it is not necessary to show that the names were reused by Noah and his sons. Rather, the evidence presented above demonstrates that it is possible that the pre-Flood names could have been reused after the Flood by any of Noah's descendants, because in fact some names are reused, and all of the names represent generic geographic features.

Munday has not demonstrated that the names are not generic terms used before and after the Flood. He seems to dismiss the possibility because it does not support his view.

2) Other Pre-Flood References Support Genesis 2 as being for a Pre-Flood Audience

In Genesis 4 references are made to two locations, Nod (Gen 4:16) and Enoch (Gen 4:17). If Moses wrote the book of Genesis and used names that were meaningful to his contemporaries, then we should expect to find some references to these locations outside of this account (either in the Bible or elsewhere). However neither of these locations can be identified in a post-Flood context. The fact that they cannot, seems to indicate that their location was relevant for a pre-Flood audience. Also, the fact that the location Enoch was named after a pre-Flood person, seems to indicate that the account in Genesis 4 is given from a pre-Flood perspective.

There is additional support for the idea that Genesis 4 provides names for a pre-Flood audience, and from a pre-Flood context. It is found in the references to the sons of Lamech. We are told in Genesis 4:20-22 that Jabal "was the father of those who live in tents and raise livestock," and that Jubal "was the father of all who play the harp and flute." It is evident that this account was written for a pre-Flood audience. After the Flood there were no descendants of Lamech left alive. His sons could not be the ancestors of any post-Flood herdsmen or musicians, since all who came after the Flood were descended from Noah.

If it is the case that Nod and Enoch were the names of pre-Flood locations given to a pre-Flood audience, and if the reference to Jabal and Jubal is for a pre-Flood audience, then it is consistent to consider the locations in Genesis 2 as being pre-Flood locations mentioned for a pre-Flood audience.

Of course, one could argue that Moses preserved the account of Genesis 4 as it was handed down, but changed the account in Genesis 2 for his contemporary audience. If one wants to argue for this view, then he would have to demonstrate that this is the case. Munday appears not to have demonstrated this; he has assumed it.

3) It May Not be Possible to Identify Eden's Location, Even in General Terms

Munday goes to considerable length to identity the location of the Garden and Eden, and comes to the conclusion that he can give it a fairly precise location. He says:

> Gen 2:8-14 contains the geographic data subjected to most analysis over the years. Because several pieces of the data therein have allowed no determinative conclusion, some commentators have concluded that the garden's location is obscure and will remain so. This conclusion is accurate only with regard to a precise fix on the garden's location, because as will be shown the data certainly indicate the garden's probable regional location to within roughly 15,000 square miles, i.e., the southern Mesopotamian valley near the Persian-Arabian Gulf. This conclusion is the common one ... (Munday, 1996, p. 133)

As Munday undoubtedly knows, other expositors have taken the same data and come to a very different conclusion. For example, Keil and Delitzsch use the data to point to a northern location:

> According to the present condition of the soil, the sources of the Euphrates and Tigris are not so closely connected that they could be regarded as the commencement of a common stream which has ceased to exist. The main sources of the Tigris, it is true, are only 2000 paces from the Euphrates, but they are to the north of Diarbekr, in a range of mountains which is skirted on three sides by the upper course of the Euphrates; and separates them from this river. We must also look in the same country, the highlands of Armenia, for the other two rivers, if the descriptions of paradise actually rests upon an ancient tradition, and is to be regarded as something more than a mythical invention of the fancy. The name *Phison* sounds like the *Phasis* of the ancients, with which *Reland* supposed it to be identical; and *Chavilah* like *Colchis,* the well-known gold country of the ancients. But the φάσις ο κόλξος *(Herod.* 4, 37, 45) takes its rise in the Caucasus, and not in Armenia. A more probable conjecture, therefore, points to the *Cyrus* of the ancients, which rises in Armenia, flows northwards to a point not far from the eastern border of Colchis, and then turns eastward in Iberia, from which it flows in a south-easterly direction to the Caspian Sea. The expression, *"which*

> *compasseth the whole land of Chavilah,"* would apply very well to the course of this river from the eastern border of Colchis; for סבב does not necessarily signify to surround, but to pass through with different turns, or to skirt in a semi-circular form, and *Chavilah* may have been larger than modern *Colchis.* It is not a valid objection to this explanation, that in every other place Chavilah is a district of Southern Arabia. The identity of this Chavilah with the Chavilah of the Joktanites (chap. x. 29, xxv. 18; 1 Sam. xv. 7) or of the Cushites (chap. x. 7; 1 Chron. 1.9) is disproved not only by the article used here, which distinguishes it from the other, but also by the description of it as land where gold, bdolach, and the shoham-stone are found; a description neither requisite nor suitable in the case of the Arabian Chavilah, since these productions are not to be met with there. This characteristic evidently shows that the Chavilah mentioned here was entirely distinct from the other, and a land altogether unknown to the Israelites. ...The *Gihon* (from גּוּהַ to break forth) is the *Araxes,* which rises in the neighbourhood of the Euphrates, flows from west to east, joins the Cyrus, and falls with it into the Caspian Sea. The name corresponds to the Arabic *Jaihun,* a name given by the Arabians and Persians to several large rivers. The land of *Cush* cannot, of course, be the later Cush, or Ethiopia, but must be connected with the Asiatic Κοσσαία, which reached to the Caucasus, and to which the Jews (of Shirwan) still give this name. But even though these four streams do not now spring from one source, but on the contrary their sources are separated by mountain ranges, this fact does not prove that the narrative before us is a myth. Along with or since the disappearance of paradise, that part of the earth may have undergone such changes that the precise locality can no longer be determined with certainty (Keil and Delitzsch, 1949, pp. 82-83).

Munday dismisses the northern location. "[O]ne might argue for a different location for the garden. But the geographic data do not harmoniously point anywhere else (Munday, 1996, p. 150)." But how does his proposed location stand in the face of analysis?

In Genesis 2.8-14 there are eight geographic references. Munday's conclusion about each, with my comments, is as follows:

Eden

> Hence, it is concluded that Eden was east of Canaan. The latitude in biblical compass directions allows eastward locations to include not only Babylonia but also Assyria (present-day Kuwait, Iraq, and Iran); in fact, any location from the "Trans-Jordan to the far side of Mesopotamia" is allowed (Munday, 1996, p. 134).

Since 'eden' can mean generically a fertile plain, we are told in Genesis 2.8[3] that God planted a garden in the eastern portion of a fertile plain. To suggest that this had to be east of Canaan, is to assume the point that is being proved. If Moses did not write the account, but rather the account came down from Adam, it could be just as valid for Adam to give the location as east of wherever he was living. To conclude that Eden was east of Canaan is to read something into the passage which is simply not there.

Pishon/Havilah

> An intriguing possibility for the Pishon has been highlighted in Landsat imagery. The now-dry Wadi Batin, which forms the present-day northwestern boundary of Kuwait, is clearly delineated by Landsat across more than 400 km of Arabian desert. This region fits the possible location for Havilah. Zarins believes that the Wadi Batin was the Pishon, and that the Karun River from the Zargos Mountains was the Gihon. Consequently, Zarins believes the garden was close to the present Gulf head (Munday, 1996, pp. 140-141).
>
> In conclusion regarding Pishon, its association with Havilah is consistent with a location somewhere in Arabia, most likely its northern half somewhere eastward of Edom and Moab. The probability is that the Pishon coursed through the eastern half of the Mesopotamian valley, a region traditionally proposed as the garden site (Munday, 1996, p. 141).
>
> The mention of Havilah, nevertheless, does point to the Arabian peninsula. As a place name, Havilah is used in Gen 25:18 and I Sam 15:7... Havilah must have lain at the other [eastern] end, to the east, of the Amalekite range of habitation (Munday, 1996, p. 141).
>
> [T]he accepted derivation of the word Havilah from a West Semitic root meaning "sand" and hence "land of sand" (Munday, 1996, p. 139).

When one reads the account in Genesis 2.8-14, he gets the impression that the Pishon was a significant river equal in importance to the other rivers mentioned. It seems to be incredible that a major river such as the Pishon could disappear from the historic and geographic records so that it left effectively no historic trace of its location. Much of the geography from Moses' day is still identifiable. If the Pishon was a major river in Moses' day, then we would expect to find other historical references to it, or at least be able to identity its location more easily. The fact that Munday has to appeal to a dry wadi as a potential location for the Pishon, seems to indicate that the Pishon did not exist after the Flood.

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[3] A literal rendering is: "And he planted, the LORD God, a garden in a fertile plain [Eden], from/in the east."

The Amalekites and Ismaelites who appear to have lived in the region of Havilah (Gen 25:18; 1 Sam 15:7) are generally considered to have lived in a territory ranging from the southwest of what is today the Gaza strip, through the northeastern part of the Sinai peninsula to the westernmost part of the Arabian peninsula [south of modern Jordan] (Douglas, 1982, p. 454 and Avraham, 1986, p. 168). They appear to have controlled, or at least used, the caravan route which went from Egypt through Canaan and on to Assyria (e.g., Gen 38:27-29). This location for Havilah is at least 1,000 km from "the southern Mesopotamian valley near the Persian-Arabian Gulf."

It seems hard to reconcile the location of the Havilah of Genesis 2 and I Sam 15:7 with Munday's proposed location for the Garden of Eden, and with a dry wadi that is supposed to have been a river flowing through what is now the Arabian desert. It seems to be more reasonable to understand the term 'havilah' in Genesis 2.11 as a different location and to accept the suggestion that the generic sense of 'havilah' ('land of sand') could easily be used to refer to both a pre-Flood location and a post-Flood location.

Gihon

> The Hebrew גיחון derives from a root meaning "to bubble"; such a name could hardly apply to a placid river on a plain, unless its head were in hill country (Munday, 1996, p. 141).

> In sum, the Gihon probably was a river flowing from Kassite country in the Zagros mountains into the Tigris-Euphrates system near the Gulf. The Gihon perhaps was the Karun River, or possibly the Kerkha River (Munday, 1996, p. 142).

The location of the Gihon cannot be identified in contemporary geographic terms, and appears rarely in the historical records. As with the Pishon, it is hard to believe that the location of a second major river in Moses' day would no longer be identifiable. It is also clear from Munday's own word-analysis that the location of the Gihon does not fit well with the current southern flat Mesopotamian geography in which the rivers flow placidly. It is simpler to conclude that the reference to the Gihon is given in a pre-Flood context rather than in a post-Flood context.

Cush

> The term כוש is found in many Hebrew scriptures and is identified as either Cush or Classical Ethiopia (i.e., modern Sudan). The identification Ethiopia is certain in many instances, such as Num 12:1; Esth 1:1; and Jer 13:23. But an African location is not at all indicated by Gen 2:13, unless Eden's geography is regarded as fantasy (Munday, 1996, p. 141).

The fact that Cush in the remainder of the OT is not used to refer to a southern Mesopotamian location, and instead is found in a very distant geographic location does not support Munday's conclusion: "These data indicate an Arabian-Mesopotamian context for Cush in Gen 2:13" (Munday, 1996, p. 141). Contrary to what Munday says, we do not need to conclude that Eden's geography must be regarded as a fantasy if Cush is not in an Arabian-Mesopotamian context. Rather, it supports the view that the author is describing a pre-Flood geography, not a post-Flood geography.

Tigris/Asshur

> While the Hebrew for the third river is חדקל ("Hiddekel"), there is almost universal agreement at present that the river indicated is the Tigris. This name is a modern Greek equivalent of the Persian *Tigras,* Arabic *Dijlat* (or *Diglat),* from the Akkadian *Idiglat* and Sumerian *(I)digna.* ...The root meaning of Tigris is "arrow," as to "signify a dart, or swiftness (Munday, 1996. p. 141)."

> In Scripture and elsewhere, the word Asshur is used to designate the city, the region, the nation, and a deity. Without any doubt, the word here refers to the capital city of Assyria (Munday, 1996, pp. 142-143).

It is the case that the term 'hiddekel' is used in Assyrian monuments to refer to the same river that is called elsewhere by the name Tigris. This does not in itself prove that the reference in Genesis 2.14 is in fact the same river as that mentioned in Dan 10:4 and known as the Tigris today. It is quite possible that the term 'hiddekel' was used in its generic sense ("arrow," to "signify a dart, or swiftness") to refer to a river after the Flood, or was used to name a river which reminded the first post-Flood inhabitants of Assyria of the river they found mentioned in Adam's account of the geography of Eden.

Genesis 2.14 tells us that the Tigris "runs along the east side of Asshur." Since the term 'havilah' in the context of a river is understood to be a geographic territory, we should be consistent and assume that the term 'asshur' also refers to a territory. However, in a post-Flood context the Tigris does not run along the east of the territory of Asshur (Assyria); it runs to the west of the fertile and densely populated portion of Assyria (Douglas, 1982, p. 98). This, of course, does not fit with Munday's interpretation; so he concludes that the reference to 'asshur' is to the post-Flood city rather than the territory. Munday switches identifications to support his theory. He fails to demonstrate that the Tigris of today must be the 'hiddekel' referred to by the Genesis 2 account. Munday accuses Morris of using the word 'evident' to describe his understanding of the geography of Eden (Munday, 1996, p. 151). He has done essentially the same thing when he concludes that “without any doubt” the term Asshur refers to the capital city.

Euphrates

> The 19 instances of פרת in Scripture have always been held to refer to the Euphrates (Munday, 1996, p. 143).

It cannot be disputed that most[4] of the uses of the term פרת refer to the Euphrates river. This does not prove, however, that the location in Genesis 2.14 is the same river as that referred to in the post-Flood context, especially since the term פרת as we have noted, has such a generic meaning - “good and fertile stream.” The Euphrates of today is the river mentioned in Genesis 2 only if the Moses wrote Genesis 2 and used names of geographic locations which were known to the Israelites around 1500 B.C.

Of the eight geographic locations mentioned in Genesis 2, only three (Tigris, Asshur, Euphrates) are easy to locate in modern geographic terms, and then only if interpreted in a particular way (e.g., reading Asshur as a city rather than as a territory), and only if it is assumed that Moses wrote Genesis 2 for a contemporary audience. Yet, Munday concludes:

> All the above considerations converge very strongly on the conclusion that the garden of Eden was located in Babylonia. ... Taking into account all the evidence points more harmoniously to Babylonia (Munday, 1996, p. 143).

He then moves from this conclusion to the point he really wants to make: That there could not have been a world-wide Flood of cataclysmic proportions:

> If actualism guides a conception of garden geography, then finding the site in the present lower Mesopotamian Valley precludes Flood geology, because the supposed consequence of the Flood was a deposit miles in thickness, and, inevitably, obliteration of all geographic clues (Munday, 1996, p. 150).

Rather than being a straightforward matter of mapping the references in Genesis 2 to modern geography, it appears from the evidence that it may not be possible to identity Eden’s location, even in general terms. The evidence in fact points more clearly to a unique pre-Flood geography and the reuse of generic terms for geographic terms in a post-Flood context. Morris’ conclusion about the evidence appears to be more accurate than Munday’s:

> In general, it is evident[5] that the geography described in these verses does not exist in the present world, nor has it existed since the Flood. The rivers and countries described were antediluvian geographical features, familiar to Adam the original author of this part of the narrative. They were all destroyed, and the topography and geography completely changed, when “the world that then was, being overflowed with water, perished” (II Peter 3:16) (Morris, 1976, pp. 89-90).
>
> This means, in turn, that the names which seem to be postdiluvian (Ethiopia, Assyria, Tigris, Euphrates) were originally antediluvian names. The names were remembered by the survivors of the Flood and then given to people or places in the postdiluvian world, in memory of those earlier names of which they were somehow reminded later (Morris, 1976, p. 90).

4) Some Other Biblical Examples of Geography or History are Understandable only by a Contemporary Audience

Someone might contend that an account of pre-Flood geography would have little relevance to a post-Flood audience. In one sense this is true, since the account of Eden’s geography did not give Jewish readers, and does not give us, any useful information with respect to locating the Garden of Eden. This however does not make the account irrelevant. The Holy Spirit may have determined to include some aspects of the original geography of the Garden:

1. To convict the pre-Flood world of its sin (Gen 6:5). The account written by Adam would point to a real location and would vividly remind them that they were sinners under judgment.
2. To remind the post-Flood world, that the Garden was real, a place positioned in space, and not just a fairy-tale.
3. To point to the coming eternal Paradise which will be a well-watered, fruitful land.

The references to the geography of Eden are, in principle, no different from the geographical references we find in other parts of the OT (e.g., Gen 13:18; Josh 15-19), or the lists of names we find in many places in the OT (e.g., Gen 4:18, 5, 35; Ezra 2). These accounts and lists were written for a specific audience in ancient times and are somewhat obscure to us. Although we may not be able to understand all the details, this does not make the accounts and lists irrelevant for us.

Munday’s Assumptions Fail to Support his Hypothesis

The portion of Scripture we have been considering reads as follows:

> A river watering the garden flowed from Eden; from there it was separated into four headwaters. The name of the first is the Pishon; it winds through the entire land of Havilah, where there is gold. (The gold of that land is good; aromatic resin and onyx are also there.) The name of the second river is the Gihon; it winds

---

[4] There may be some doubt about the word as it is used in Jer 13:4-7. If this is the same word, it may give evidence for a generic use of the word פרת.

[5] That is, from Morris’ preceding consideration of the difficulties of associating the geographic references with contemporary geography.

> through the entire land of Cush. The name of the third river is the Tigris; it runs along the east side of Asshur. And the fourth river is the Euphrates (NIV, 1984).

A face-value reading of this passage, as it is translated in the NIV, indicates that a single river flowed from Eden and went through the Garden and then broke into four rivers after it had passed through the Garden. There is nothing in the contemporary Middle Eastern geography which corresponds to this description. There is no southern Arabian-Mesopotamian location which corresponds to the description of a single river branching into four rivers.

Munday bases his argument on two assumptions:

1. Moses wrote the account in Genesis 2, and
2. Genesis 2 was written for contemporaries of Moses.

Both of his assumptions appear to be false. He has not proven that Moses wrote Genesis 2, nor has he given evidence that Genesis 2 was written from the perspective of Moses' readers. He has assumed both. The natural and literal reading of Genesis 2 is from the perspective of someone (i.e., Adam) who lived while the Garden still existed and who knew precisely where it was. This implies that it was written for a pre-Flood audience. Munday needs to demonstrate that the audience was in fact 15th century B. C. Israelites. Unless he can demonstrate this, the natural conclusion is that Genesis 2 was written for a pre-Flood audience.

We do not need to accept Munday's conclusion:

> The possible resolution of the problem is to weaken (or abandon) either (1) Flood geology or (2) actualism in the garden geography. Either alternative necessitates a change in paradigm derived from the literal hermeneutic (Munday, 1996, pp. 150-151).

We can in fact accept the Genesis 2 account as being an actual statement of pre-Flood geography, and also accept that there was a world-wide flood that changed the geography of the earth to such an extent that it is not possible to find the location of the Garden of Eden in a post-Flood world.

It is a sad commentary on the state of the Church today when a purportedly Reformed and Presbyterian publication such as *The Westminster Theological Journal* agrees to publish an article such as Munday's which clearly does not admit a Reformed perspective on either hermeneutical strategy or Biblical authority. It is questionable that the editors of *The Westminster Theological Journal* continue to hold to their historic confession. The Westminster Confession of Faith is very clear in terms of how we are to interpret Scripture:

> All things in scripture are not alike plain in themselves, nor alike clear unto all; yet those things which are necessary to be known, believed, and observed, for salvation, are so clearly propounded and opened in some place of scripture or other, that not only the learned, but the unlearned, in a due use of the ordinary means, may attain unto a sufficient understanding of them. (Confession of Faith, 1959, 1:7)
>
> The infallible rule of interpretation of scripture is the scripture itself; and therefore, when there is a question about the true and full sense of any scripture (which is not manifold, but one), it must be searched and known by other places that speak more clearly. (Confession of Faith, 1959, 1:10)

If we are to determine whether or not there was a world-wide Flood, the solution is not to concoct, as Munday does, an indirect and obtuse argument from a passage of Scripture that does not deal with the Flood (Genesis 2). The solution is to accept the clear teachings of the OT and NT (such as Gen 7:17-24 and 2 Pet 3:5-7) which unequivocally demonstrate that the Bible intends to teach that the Flood of Genesis was world-wide and cataclysmic in action.

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Quote - Psalm 72:12-17

12 For he will deliver the needy who cry out, the afflicted who have no one to help.
13 He will take pity on the weak and the needy and save the needy from death.
14 He will rescue them from oppression and violence, for precious is their blood in his sight.
15 Long may he live! May gold from Sheba be given him. May people ever pray for him and bless him all day long.
16 Let grain abound throughout the land; on the tops of the hills may it sway. Let its fruit flourish like Lebanon; let it thrive like the grass of the field.
17 May his name endure forever; may it continue as long as the sun.

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Van Andel Creation Research Center Field Study Note

KANAB CANYON, UTAH AND ARIZONA: ORIGIN SPECULATIONS

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Abstract

How Kanab Canyon, a side canyon of the Grand Canyon, may have developed within a young-earth Flood model is discussed. The draining of a lake ponded in southwestern Utah and possibly northwestern Arizona was the major cause for the formation of lower Kanab Canyon. Upper Kanab Canyon has developed since the 1800's because of flooding from thundershower activity. The following phases of erosion are postulated; a. during the retreat of Floodwater, b. draining of a post-Flood lake, c. precipitation during a warm post-Flood ice age, d. recent erosion from thundershower activity. Periods b and c may have overlapped chronologically. Processes such as cliff sapping are necessary to explain some of the topography of the high plateaus region of southwestern Utah.

Introduction

Acceptance of a recent Creation and Flood model of earth history implies that many natural events, such as canyon formation, are recognized to have occurred quickly. This necessitates rapid erosion, a topic often discussed in the Quarterly. For instance, three articles (Williams, Meyer and Wolfrom, 1991, 1992a, 1992b) presented various views of the formation of the Grand Canyon of the Colorado River. (Also see Austin, 1984a, 1984b, 1986, 1994a, 1994b; Brown, 1994; Oard, 1993; Williams, 1993.) An introductory study of the erosion of Pine Creek Gorge in Pennsylvania has been published (Williams, Chaffin, Goette and Meyer, 1994).

A discussion of the formation of Bangs Canyon, Colorado was given by Holroyd (1994). The rapid erosion and canyon formation caused by the 1993 Midwest floods was graphically illustrated by Wolfrom (1994). In a 10-year study at Providence Canyon, Georgia, Williams (1995) outlined the effects of recent catastrophic erosion. Speculation on the origin of Santa Elena Canyon in Big Bend National Park have been reported (Williams and Howe, 1996). This treatise on Kanab Canyon is another introductory study reflecting the continuing field work of the Society on the topics of rapid erosion and canyon formation which are important aspects of Flood geology. A glossary of geological terms used in this paper is provided after the acknowledgments.

Canyon Location

The mouth of Kanab Canyon intersects the Grand Canyon approximately 144 river miles below Lees Ferry, Arizona (Figure 1). Kanab Canyon is one of the larger side canyons of the Grand Canyon of the Colorado River. Kanab Creek flows from the Sunset Cliffs on the western end of Paunsaugunt Plateau in Utah through Kanab Canyon into the Colorado River (Figure 2). The canyon, creek and Paunsaugunt Plateau lie within the western portion of the widespread Colorado Plateau province (Figure 3).

Kanab Plateau and Lower Kanab Canyon

Gregory (1950, p. 169) estimated that 6,000 to 8,000 feet of rock have been eroded from Kanab Plateau leaving a planar erosional surface with sparse vegetation growing upon it. Hamblin and Best (1970, p. 138) refer to this surface as a pediment. See Appendix I for a discussion of how the estimate of 6,000 to 8,000 feet of eroded rock was obtained.

Gregory noted that after Kanab Creek flows from the high plateaus of Utah (Figure 2) into the flatland at Fredonia, Arizona, the stream passes "...through a profound canyon to its mouth in the Grand Canyon" (1950, p. 10). Kanab Canyon is an impressive canyon in its own right (Figure 4), but it is dwarfed by the Grand Canyon, the major erosional feature of the Colorado Plateau. Below the mouth of Johnson Wash (Figure 2), Kanab Creek flows into lower Kanab Canyon which at its mouth is as deep as the Grand Canyon (Gregory, 1950, p. 164). See Appendix II for a three-dimensional drawing of the mouth of Kanab Canyon.

One of the interesting features of the lower canyon is the presence of incised meanders (Figure 5). Hamblin and Rigby (1969, pp. 56-57) considered these meanders as evidence that the creek is "...as old or nearly as old as the Colorado River" (p. 57). Gregory (1950, p. 157) speculated that such meanders

> ...now deeply entrenched, were left from ancestral streamways on old surfaces where meandering courses were characteristic, and that in consequence of regional uplift they have been incised without much change in form.

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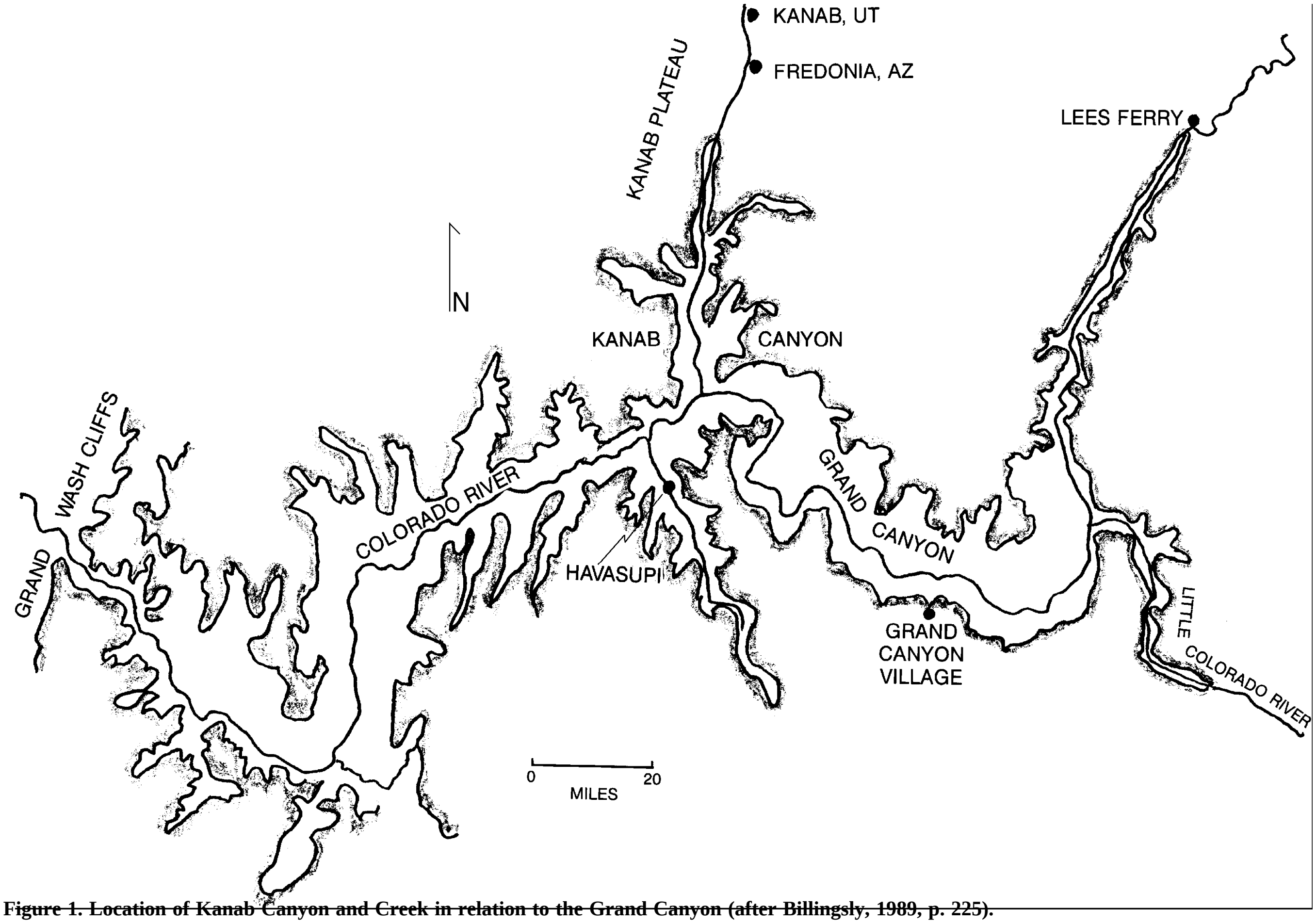

Figure 1. Location of Kanab Canyon and Creek in relation to the Grand Canyon (after Billingsly, 1989, p. 225).

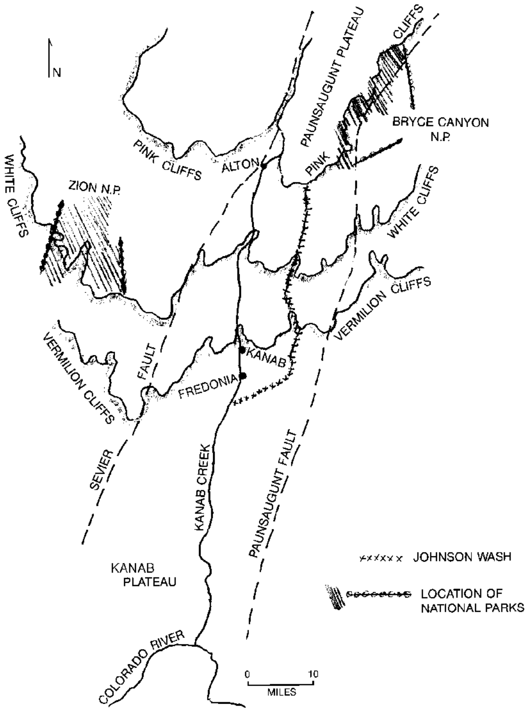

Figure 2. Location of Kanab Creek in relation to the High Plateau region of Utah above Kanab Plateau (after Gregory, 1950, p. 5 and Webb, Smith and McCord, 1991, p. 1) Also see Figure 9, this paper.

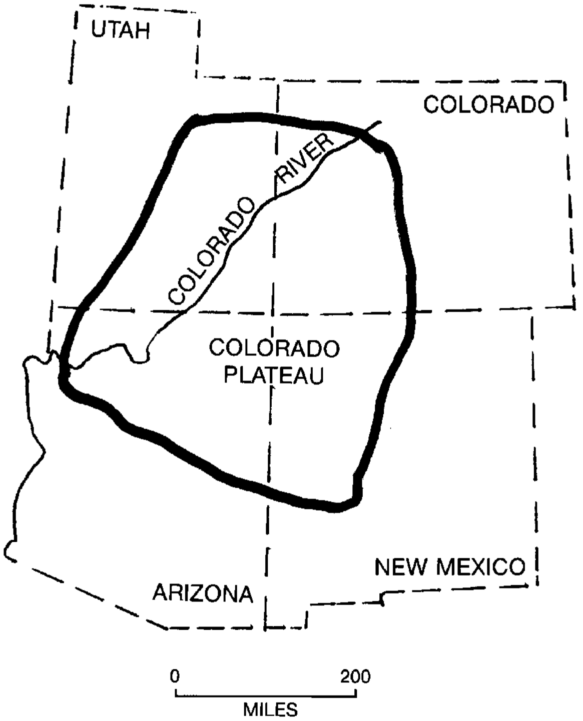

Figure 3. Location of the Colorado Plateau in the western United States (after Huntoon, 1989, p. 73).

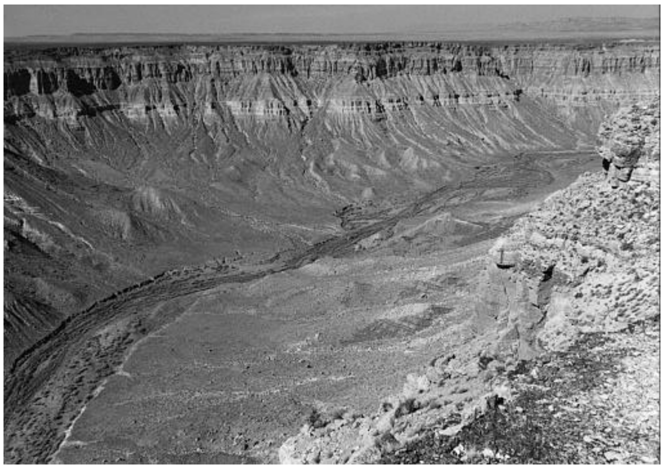

Figure 4. Lower Kanab Canyon looking north from Gunsight Point (Robert Goette).

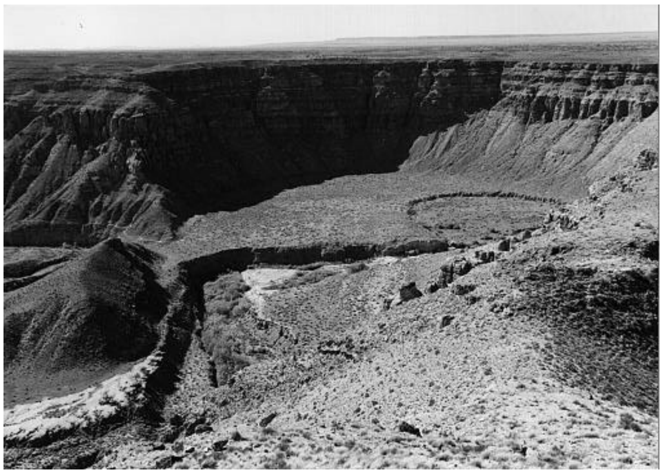

Figure 6. Smaller enclosed meander of Kanab Creek within the larger incised meander of lower Kanab Canyon (Robert Goette).

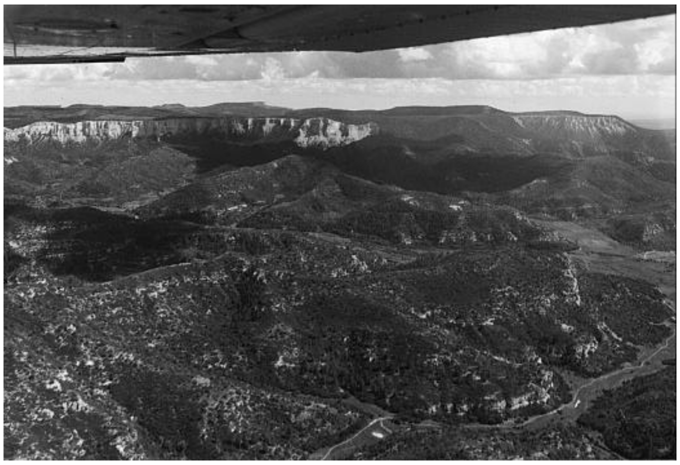

Figure 7. Sunset Cliffs on the western edge of Paunsaugunt Plateau (Robert Goette).

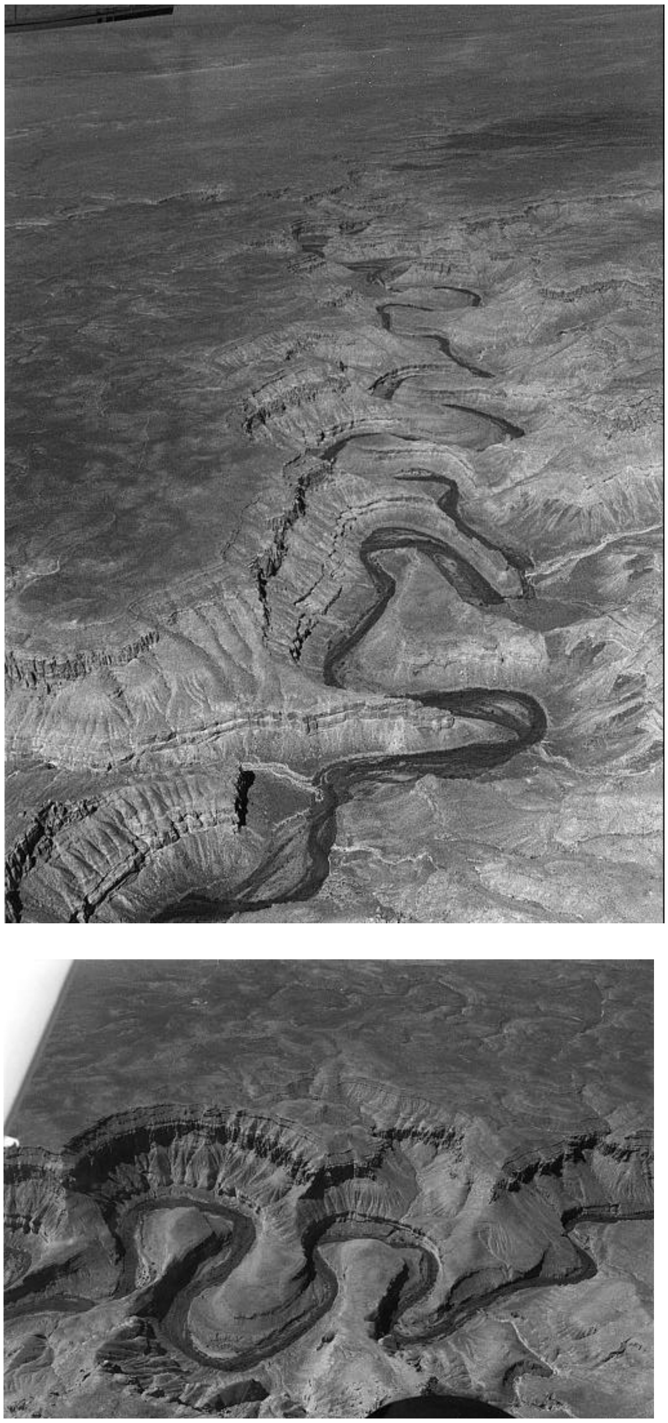

Figure 5. Incised meanders in lower Kanab Canyon (Robert Goette) a. View toward the north, Gunsight Canyon (right center) joins Kanab Canyon. b. Aerial view of meanders north of Gunsight Canyon.

The most penetrating commentary on the presence of incised meanders along canyon walls on the Colorado Plateau was made by Austin (1994a, pp. 98-99), and is applicable to this study. He showed that a high discharge rate of flowing water, coupled with a drop in the regional groundwater table, is able to "...cause meanders to be incised vertically" (p. 98). A rapid discharge of water, created when a dam ponding a lake is breached, would cause meanders to be incised in strata along the flow path of the released water (p. 98). Possibly a lake was located on, or north of Kanab Plateau which could have drained rapidly generating the meanders shown in Figure 5? A complete discussion of stream meanders can be found in Morris and Wiggert (1972, pp. 502-523). They concluded that to form incised or entrenched meanders,

> ...it would seem necessary to postulate much greater volumes of water in the streams than now present, together with much less resistant walls than the rocks of which they now consist (p. 523).

Another interesting feature of the lower canyon is that today the creek is grossly underfit (Figure 4 and 6). Again referring to Austin (1994a, p. 98), this situation indicates that the present stream has a relatively low discharge rate, but in the past "...there was at least one episode of very high discharge" to carve such a large canyon.

Upper Kanab Creek and the Headwaters of Kanab Creek

The Sunset Cliffs (Figure 7) on the western edge of Paunsaugunt are part of the Pink Cliffs in which the beautiful erosional features of Bryce Canyon National Park are found (Figure 8). As Goode (1966, p. 15) explained, "Kanab Creek heads...under the Pink Cliffs northeast of Alton." (See Figure 2.) Tilton (1991, p. 4) noted, "In the upper reaches, the tributaries of Kanab Creek flow through steep canyons cut into...sandstones and mudstones." Then the creek flows onto the easily erodible mudstones of Tropic Shale and alluvium deposits.

The flow from upper Kanab Creek does not necessarily reach the lower region of the creek. Goode (1966, p. 15) claimed that springs in the lower creek area sustain the flow there. Thus,

> ...although upper Kanab Creek forms continuous drainage with lower Kanab Creek the two portions of the drainage system may be considered separate because the source of the base flow (ground water runoff) for the two sections of the system are different, and normally only spring runoff and flood waters provide a continuous flow of water from the head of Kanab Creek through its lower reaches (Goode, 1966, p. 16).

Woolley (1946, p. 73) observed that Kanab Creek, "At ordinary stages...is in part subterranean sinking into the sand of its bed to reappear only where a ledge of rock rises to bar its way."

Kanab Creek flows from north to south through the Grand Staircase (Figure 9), a series of cuestas; heading below the Pink Cliffs, passing through the White Cliffs and Vermilion Cliffs, then through Kanab, Utah, into the flatlands of Kanab Plateau at Fredonia, Arizona, and finally on to the Colorado River (Figure 2).

Recent Erosion along Upper Kanab Creek

In the late 1800's, severe thunderstorms caused considerable erosion in the upper reaches of Kanab Creek. For instance, Dellenbaugh (1988, p. 180) commenting in 1908 on the subsequent formation of the canyon near Kanab, Utah, stated:

> While camped below Kanab [in 1872], Clem and I in walking one day saw a place where the creek which flowed on a level with the surroundings suddenly plunged into a deep mud canyon. This canyon has been cut back from far below by the undermining action of the falling water, and it was plain to see that it would continue its retrogression till it eventually reached the mouth of the great canyon several miles above, but I did not dream that it could accomplish this work as rapidly as it actually did years after. During a great flood it washed a canyon not only to Kanab but for miles up the gorge, sweeping away at one master stroke hundreds of acres of arable land and leaving a mud chasm forty feet deep. [Brackets added.]

Gregory gave a graphic description (1950, pp. 174, 175) of the recent erosion along upper Kanab Creek, employing quotes from the diary of a pioneer, Henry E. Riggs. When the town of Kanab was settled in 1871, the creek flowed weakly and was shallow. During the summer it often disappeared. The stream was bordered by meadows and considerable swamps with vigorous vegetation. "It was almost impossible to ride a horse up the canyon on account of mud holes, quicksands, and brushy thickets" (p. 174). After 1874, the canyon floor was fenced for pasture and farming. With these changes, the creek developed fewer channels with an increased flowrate.

The first sizeable flood was recorded in July 1883.

> It swept away all the farm lands and meadow lands in the canyon as well as field crops just south of the village [Kanab, Utah] and scoured out a broad channel beneath the valley floor (p. 174). [Brackets added.]

Floods occurred daily for about a month in each of the years 1884 and 1885. It was estimated that because of this flooding (1883-1885) "...the stream bed was cut down

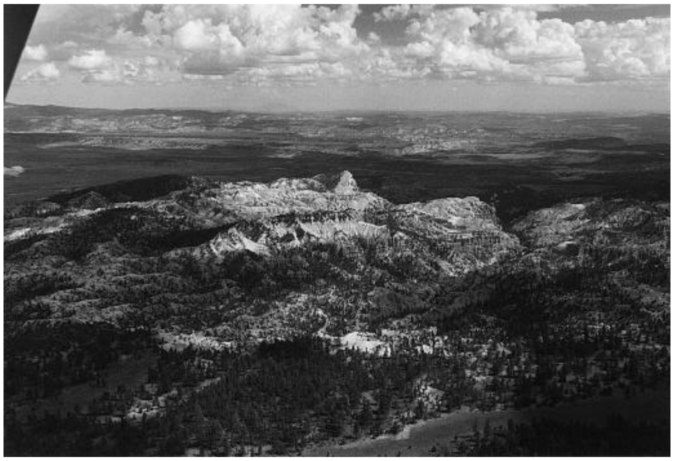

Figure 8. Portion of Bryce Canyon National Park erosional structures on the eastern edge of Paunsaugunt Plateau (Robert Goette).

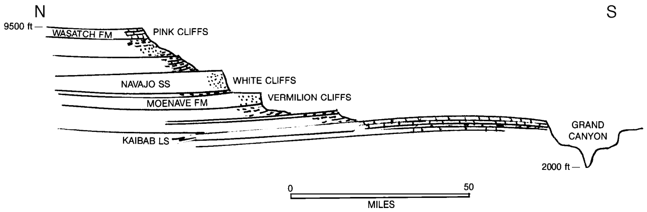

Figure 9. Cross-Section of the "Grand Staircase" (after Hamblin and Best, 1970, p. 141). Also see Figure 2, this paper.

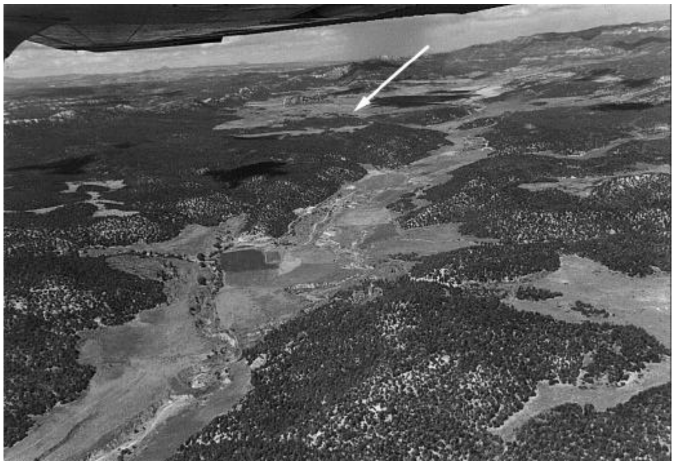

Figure 10. Alton amphitheater as indicated by arrow (Robert Goette).

about 60 feet beneath the former level, with a breadth of some 70 feet for a distance of 15 miles" (p. 174). Gregory claimed that likely 12 million cubic yards of material were carried into the village of Kanab and south into the flatlands. Woolley (1946, p. 83) presented a slightly different but still violent account:

> On August 30, 1882, a terrific flood swept down Kanab Creek Canyon and literally swamped the town. This was followed by similar cloudburst floods each summer until 1886. In that period of 5 years the creek channel was changed almost beyond the comprehension of even those who saw it. Its depth was increased by 50 feet or more and width by about 200 feet in places.

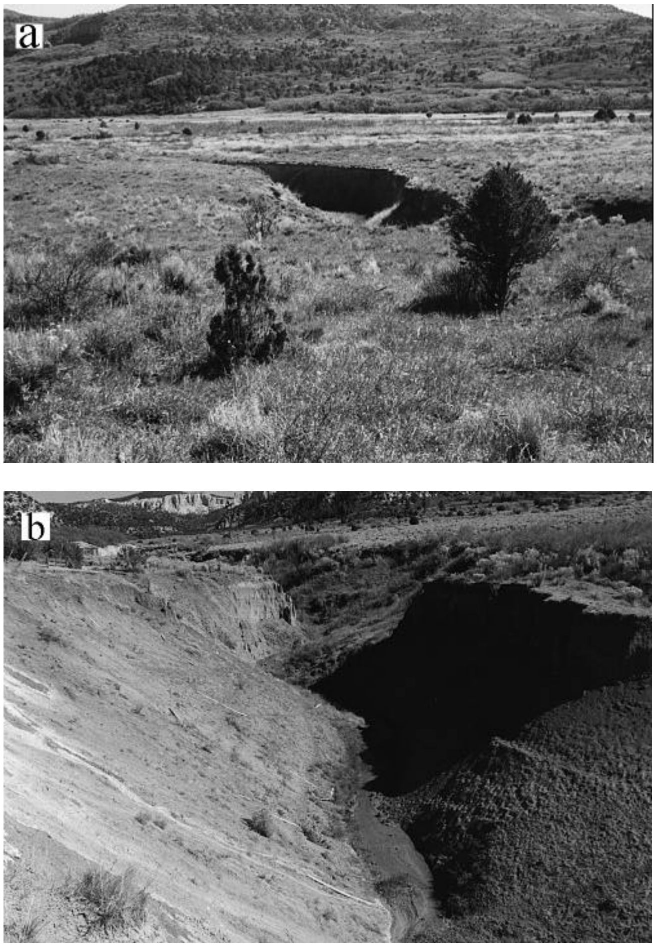

Figure 11 a. Steep-sided gullies cut by Kanab Creek in alluvium north of Alton amphitheater (Emmett Williams). b. Steep-sided gullies cut by Kanab creek in alluvium (upper center) and in Tropic Shale (foreground). Pink Cliffs are visible in the left background (Robert Goette).

Possibly the enclosed meanders inside the larger meanders of lower Kanab Creek (Figure 6) were incised because of this recent flooding as the flood waters transported abrasive material that would cut these smaller meanders. See Gregory and Moore (1931, pp. 135ff) for an interesting discussion of enclosed meanders.

Earlier Erosion in Upper Kanab Creek Region

In observing the physiography of the region just below where Kanab Creek heads, it is obvious that extensive erosion and cliff recession along the edge of Paunsaugunt Plateau has occurred in the past (Gregory, 1951, p. 82; Austin, l994a, p. 99). One of the types of erosional remnants found in the Colorado Plateau was called an amphitheater by the early geologists that studied the region.

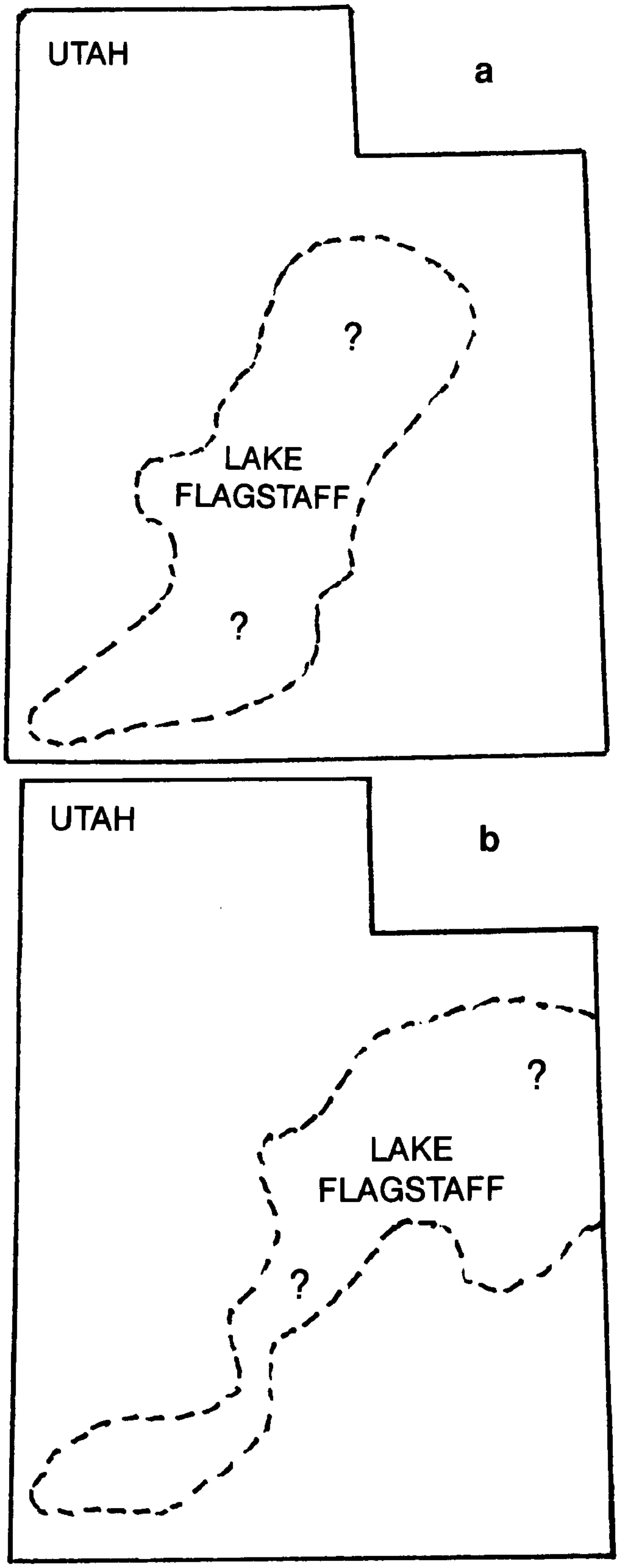

Figure 12. Suggested boundaries of hypothetical "Lake Flagstaff" in Utah as determined by paleogeographic considerations. a. (after Hintze, 1988, p. 64) b. (after Stokes, 1986, p. 154) Lake extended into Colorado.

One of these near Alton, Utah is the Alton Amphitheater (Figure 10). Gregory (1951, p. 87) described it as an "erosional indentation in the Pink Cliffs" which is a "broad relatively flat-floored, steep-sided" depression. He listed and discussed seven periods of uplift, deposition and erosion to account for the landforms of the high plateaus from a uniformitarian viewpoint (1951, pp. 82-107). Austin suggested that amphitheaters were formed by the mechanism of cliff sapping due to a catastrophic event (1994a, pp. 99-100).

> If a lake, or series of lakes on the Colorado Plateau rapidly drained, the water trapped inside the rocks along the shore and floor of the lake would escape quickly to the space previously occupied by the lake, we would expect to find large landscape scars and zones of failure, caused by water oozing out of the earth... We immediately recall the severely eroded lip of the plateau [Paunsaugunt] which forms Bryce Canyon, and countless other topographic wonders of Canyonlands in southern Utah (p. 99) [Brackets added].

Also see Froede, 1996a; Williams, 1995. Austin referred to amphitheaters as collapse features (p. 100). Such a process would occur rapidly, thus there would be no necessity to resort to extended periods of time for the development of the landform. If one doubts that the rocks of the Colorado Plateau are capable of holding large quantities of water, he should read Goode (1966) who estimated that the Navajo Sandstone in Kane County, Utah [a county of 4105 square miles in which Kanab and Alton are located], alone probably contains 10 million acre-feet of water.

If cliff-sapping events took place along the edge of Paunsaugunt Plateau, considerable alluvium would be found south of the Pink Cliffs at a later time. The water flow away from the collapsed sediments would transport some of the particulate matter southward. In the upper Kanab Creek region, many of the stream paths have been cut into alluvium (Doelling and Davis, 1989, p. 91; Tilton, 1991, p. 33). Gregory (1951, p. 103), in discussing the streams that head along the Paunsaugunt Plateau such as Kanab Creek, noted that they "...flow between walls of alluvium." See Figure 11. He stated that these streams typically "...occupy a two-storied valley - an inner gorge bounded by walls of alluvium and an outer gorge whose walls are of rock." Employing a young earth Flood model, possibly the first canyon [in rock] could have been cut by retreating Flood water.

The cliff sapping envisioned by Austin along Paunsaugunt Plateau, coupled with the flow of sediment-laden water, southward would have deposited some of the material as alluvium in the upper Kanab Creek region. This alluvium would form the base for the swamps, meadows, mudholes, quicksand, etc. seen by the pioneers when the region was settled. Kanab Creek may have flowed as a braided stream choked with sediments [See Williams, 1995, pp. 33-34],

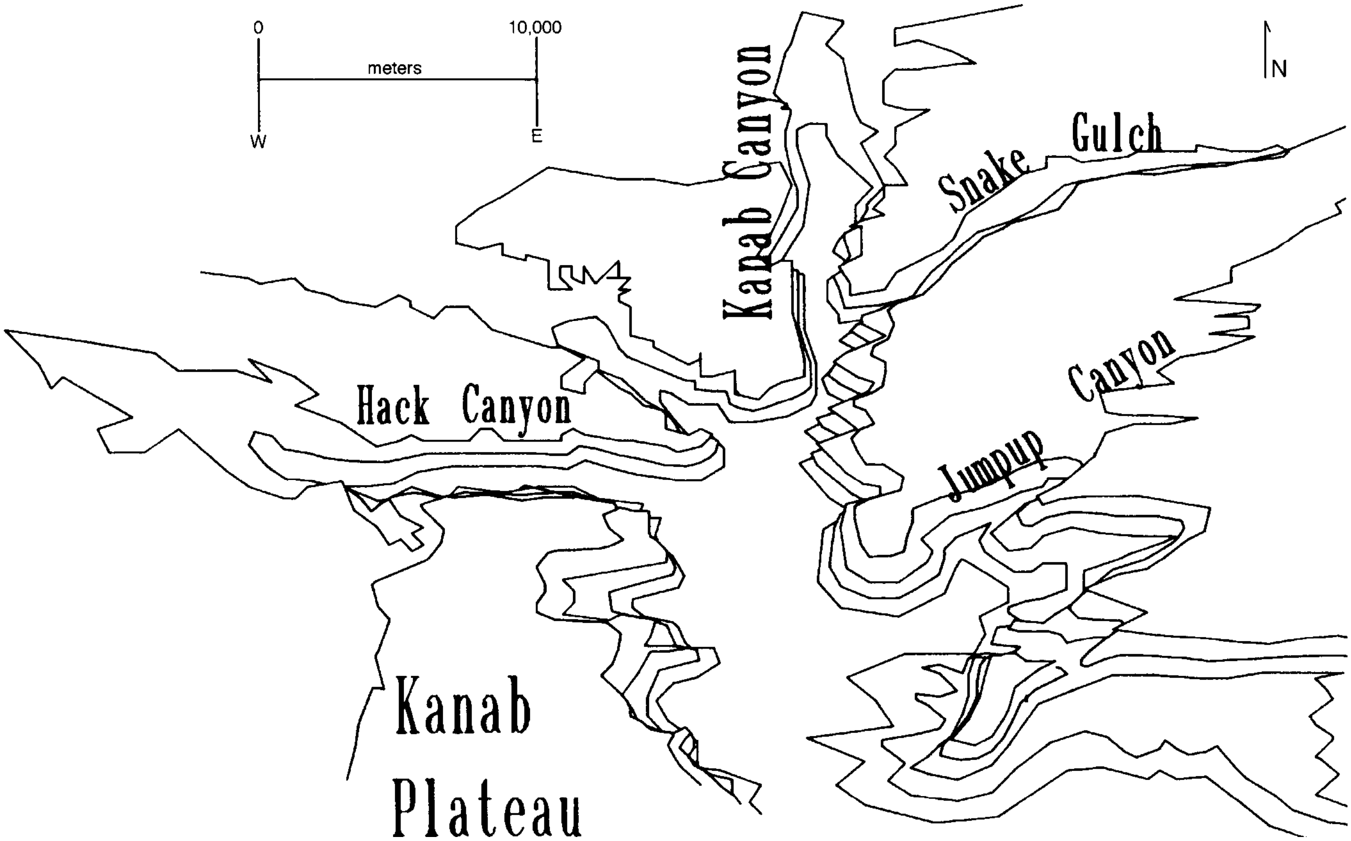

Figure 13. Three dimensional representation of the mouth of Kanab Canyon where it intersects the Grand Canyon. The scale marks 10,000 meters in the east-west direction. The distances measured in the north-south direction are twice those in the east-west direction, i.e. 1.45 inches equals 10,000 meters east and west whereas 1.45 inches equals 20,000 meters north and south. The depth intervals are recorded in 500 ft. increments. Drawing by Gene Chaffin.

often "disappearing" into the alluvium during dry periods due to a drop in groundwater level.

Likely upper Kanab Canyon or Creek did not exist until recently. Webb, Smith and McCord (1991, p. 15) commented that no mention was made of crossing Kanab Creek by members of the Dominguez-Escalante expedition of 1776. Thus they claimed "...Kanab Creek apparently did not even have a channel" in 1776. These authors stated that the steep-sided gullies of Kanab Creek near Kanab developed during the series of floods in the 1880's (p. 15). Also they claimed that the gullies near Alton (Figures 1la and b) developed "...in the 1930's during a series of relatively small floods" (p. 24). One of the possible conclusions that can be drawn from the discussions in this and the previous section is that all of these events-canyon formation, cliff-sapping, and gully formation-happened recently, which is why topography of the high plateaus appears so youthful. [See Williams, 1996.] As Gregory (1950, p. 153) said, "In a physiographic sense the region is youthful."

The Existence of Regional Lakes

Steve Austin has made a good case for the formation of the Grand Canyon by the breaching of dams ponding large lakes on the Colorado Plateau (1994a, pp. 92-107). See Brown (1994, pp. 103-105) for a similar proposal and Oard (1993) for a critique of the presence of lakes on the Colorado Plateau in the past. Also Williams, Meyer and Wolfrom (1992b) discussed the possibility of post-Flood lakes on the Colorado Plateau. Were there other lakes in existence along what is now the headwaters or present path of Kanab Creek which could have drained catastrophically to form lower Kanab Canyon?

The beauty of Bryce Canyon National Park (Figure 8) is derived from the exposure and continued erosion of the pink rocks of the Wasatch or Claron Formation* on Paunsaugunt Plateau. Stokes (1986, p. 162) claimed that "The Wasatch Formation of Southwestern Utah was laid down in a shallow, oscillating lake." Gregory (1950, p. 112) believed that the sediments in the formation appear "...to have been deposited as limy ooze and silt in shallow lakes, ponds, and bayous and as sand and gravel in the beds and at the mouths of streams." Doelling and Davis (1989, p. 87) conjectured that the formation "...is of lacustrine and fluvial origin." Gregory correlated this formation on Paunsaugunt Plateau with the Wasatch Formation of northern and eastern Utah (1950, p. 112; 1951, p. 52). However this correlation is "very loose" because the Wasatch on Paunsaugunt is almost unfossiliferous (Hintze, 1988, p. 64). Also the rocks at Bryce Canyon National Park are presumed to be equivalent to the Flagstaff Formation of central Utah (Hintze, 1988, p. 65).

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*Gregory (1951) employed Wasatch Formation when mapping Paunsaugunt Plateau. It was later called the Cedar Breaks Formation by geologists studying southwestern Utah. Today the Utah Geological and Mineral Survey supports the name Claron Formation because of its regional precedence. See Doelling and Davis, 1989, pp. 86-87; Tilton, 1991, p. 30; Stokes, 1986, p. 161.

Regardless of these name and correlation difficulties, this formation is thought to have been deposited in a lake. See Appendix III. One possibility is that it was part of a postulated body of water referred to as Lake Flagstaff [Figure 12] (Hintze, 1988, p. 64; Stokes, 1986, p. 154). In their discussion of the geology of Kane County, Doelling and Davis (1989, p. 102) noted that the lake from which the "Pink Cliffs" formation was deposited once covered the western half of Kane County and that "...the southern extent of the lake is not known."

Climate Change on Colorado Plateau: From Wet to Dry

Possible climatic changes in the western United States, particularly on the Colorado Plateau, have been discussed previously (Williams, Meyer and Wolfrom 1992b, pp. 21-22). Lammerts noted the lessening rainfall with time in the Southwest since the Flood and also speculated on the recent origin for deserts in that region (1964, p. 54; 1971, pp. 50-54; 1978, pp. 6-7). Howe (1996), in an excellent review of Wells' work (1985), agreed with Lammerts' contention that the southwestern deserts developed recently. Whitcomb and Morris (1963, pp. 303-311, 314) examined a possible changing climate after the Flood. Oard (1979, pp. 30-35; 1990, p. 78) postulated a post-Flood warm ice age that would have caused wetter conditions in places that are definitely semi-arid and arid now. Oard (1993, pp. 39-40) suggested that the deserts of southwestern United States began to develop at the end of the Ice Age. Also see Nash, 1987, p. 13; Howe, 1987, pp. 9-12.

Concerning the Kanab Creek region, Doelling and Davis (1989, p. 103) argued that there was increased precipitation and lower temperatures during the Pleistocene, followed by dryer conditions in the Holocene. Gregory (1950, pp. 175-177) did not think that past or present eras of increased rainfall could explain the erosional structures observed on the high plateaus of Utah. However Webb, Smith and McCord claim that recent erosion along Kanab Creek likely can be attributed "...to known climatic fluctuations that are related to hemispheric-scale oceanic processes" (1991, p. 24).

As an aside, Gregory (1950, pp. 175-176) as well as Webb, Smith and McCord (1991, p. 24) contend that poor land-use practices by man had an effect on the recent erosion along Kanab Creek in a manner similar to what has been noted at Providence Canyon State Park, Georgia (Williams, 1995) but other factors far outweigh this consideration.

Conclusions

The erosion of Kanab Canyon is postulated to have occurred as follows.

a. Late Flood Erosion

We suggest that as the Flood waters receded from the continental United States, possibly as much as 6,000 to 8,000 vertical feet of recently deposited sediment were removed from Kanab Plateau.

b. Post-Flood Climatic Conditions

Immediately after the Flood, considerable precipitation fell across the southwestern United States which led to rapid erosion of recently-deposited sediments as well as the formation of lakes in basins.

c. Existence of Post-Flood Lakes

We assume that such lakes existed on the Colorado Plateau. Likely water released from a lake, or lakes, ponded in northern Arizona and southwestern Utah carved lower Kanab Canyon. The timing of this breaching event in relation to the formation of the Grand Canyon is not known. But the lower reaches of Kanab Canyon offer evidence (incised meanders and an underfit stream) for a former episode of very high discharge of water.

d. Early Post-Flood Erosion in Southwestern Utah

Continued erosion of the high plateaus during a postulated wetter period would account for many of the canyons which are below the Paunsaugunt Plateau. Subsequent cliff sapping along the plateau and continued sediment transport could have deposited alluvium along the upper reaches of Kanab Creek.

e. Recent Erosion Along Kanab Creek

Recent erosion (1880's to the present) has caused steep-sided gullies to form in the alluvium along Upper Kanab Creek. Thus Kanab Canyon extended headward in this time frame from below Kanab to above Alton, Utah. Precipitation resulting from thunderstorms initiated this erosion. These storms likely are a product of climate fluctuations within the last 100-120 years. The steep-sided gullies noted in the upper Kanab Creek region are similar to the ones observed at Providence Canyon State Park, Georgia (Williams, 1995). Possibly cliff sapping processes have played a more important role in the development of Kanab Canyon than is presently recognized?

f. Obviously more field study is necessary to verify, refine or reject these postulates. The scientific work of creationists on the Colorado Plateau has just begun. Many scientific observations of the region need to be interpreted within a young-earth Flood framework. The authors urge our readers to comment on any of the speculations in this paper.

Acknowledgments

The following people offered helpful comments on the manuscript: Gene Chaffin, Jack Cowart, Carl Froede, Jr., Peter Klevberg and Michael Oard. The opinions expressed in this paper remain solely those of the authors. We thank the many donors to the Creation Research Society Research Fund, interest from which financed a portion of these studies.

Glossary

Alluvium	deposits of sand, silt or clay laid down by running water.
Bathymetry	the measurement of the depths of large bodies of water.
Braided Stream	a stream that divides into an interlacing network of branching and reuniting shallow channels due to its inability to transport its sediment load.
Claron Formation	see Wasatch Formation.
Cuesta	an asymmetrical ridge with a long, gentle slope on one side and a steep or cliff-like face on the other side.
Fluvial	pertaining to rivers, streams or creeks.
Incised Meander	a sinuous valley or canyon cut by a river during its course to the sea.
Lacustrine	pertaining to lakes.
Pediment	a broad, gently sloping erosional surface, developed by running water in an arid or semiarid region at the base of an abrupt and receding mountain front.
Sapping	erosion along the base of a cliff by wearing away the softer layers causing the collapse of large masses of material from overlying sediments.
Tropic Shale	thinly laminated to thin-bedded mudstone and shale unit with lesser amounts of sandstone, bentonitic claystone, siltstone and limestone.
Underfit Stream	a stream that appears too small to have eroded the valley or canyon through which it presently flows.
Wasatch Formation (Southwestern Utah)	known informally as the “Pink Cliffs” or “Bryce Canyon” Formation. It contains units of pink, white and gray limestone, calcareous sandstone and mudstone.

Appendix I

Estimated Erosion of Kanab Plateau

Referring to Figure 9, Gregory’s estimate of 6,000 to 8,000 ft. of sediment removed from Kanab Plateau (1950, p. 169) can be calculated as follows. Kaibab Limestone caps Kanab Plateau. As one moves north into Utah, one will find ever increasing thicknesses of strata over the Kaibab Limestone up to and including the Pink Cliffs.

Wasatch Formation
Kaiparowits Formation
Straight Cliffs - Wahweap Sandstone
Tropic Formation
Dakota Sandstone
Carmel Formation
Temple Cap Formation
Navajo Sandstone
Kayenta Formation
Moenave Formation
Chinle Formation
Moenkopi Formation
Kaibab Limestone

The Moenkopi-Wasatch thickness over the Kaibab Limestone in Utah is 8000 ft. If you assume that this thickness of strata once covered the Grand Canyon region but has been subsequently eroded leaving only the Grand Staircase in Utah, then 8,000 ft. of sediment has been eroded from Kanab Plateau. If the Wasatch and Kaiparowits did not extend into Arizona, only about 6,000 ft. of sediment would have been eroded from Kanab Plateau.

Appendix II

Representation of Mouth of Kanab Canyon

Figure 13 is a three-dimensional drawing of the mouth of Kanab Canyon where it joins the Grand Canyon. Hack and Jumpup Canyons as well as Snake Gulch are side canyons of Kanab.

Appendix III

Lake Sediments - Speculations

We assume a lake existed from which the “Pink Cliffs” Formation was deposited. Was the lake actually remaining Flood water that had been trapped by tectonic activity before it escaped from the Colorado Plateau? If this supposed trapped water were saline, would it have left the “Pink Cliffs” sediments? A quote on ancient lake environments is helpful in this context.

> Lakes are frequently referred to as “freshwater” but they are, in fact, commonly saline. From analysis of physical, chemical and biological data, evidence indicates that most ancient lake environments were dynamic, and their depositional facies reflect constant changes in tectonic setting, water chemistry and bathymetry. As a result, characteristics used to recognize a depositional setting existing during one period of a lake’s history may differ significantly from lacustrine characteristics of a different time. Thus the distribution of sedimentary structures in lacustrine depositional facies can be expected to vary significantly from one phase of a lake’s evolution to another as physical and chemical characteristics of the hydrologic basin

> change. For example, beds formed in quiet, relatively fresh, oxygenated water may be fossiliferous and bioturbated. Beds found in the same depositional setting but during an extreme alkaline or saline water phase of the lake's history may reflect little or no influence of indigenous biologic activity except possibly that of algae. Therefore to propose a set of physical and biological criteria that uniquely identify specific lacustrine depositional environments is difficult and potentially misleading (Fouch and Dean, 1982, p. 87).

Possibly some of the almost unfossiliferous Pink Cliff sediments were deposited under saline conditions. As sediments were forming along with a high level of post-Flood precipitation, the salinity could have decreased and the lake evolved into freshwater conditions (Froede, 1996b, p. 226). Then freshwater sediments were deposited.

Another more radical consideration is that possibly the Flood water was heterogenous. This possibility was investigated by Norbert Smith from a biological standpoint. Since freshwater and saltwater organisms were needed to repopulate the seas, lakes and rivers after the Flood, experiments were conducted to determine how certain water-dwelling creatures could survive a heterogeneous Flood (Smith and Hagberg, 1984, pp. 33-37). If there were layers of freshwater and ocean water that did not mix thoroughly during the Deluge, both saltwater and freshwater organisms could survive. If so, some "freshwater" lacustrine deposition was from this type of Floodwater.

Recently Woodmorappe (1996, pp. 143-152) showed how both saltwater and freshwater organisms could have survived the Flood even if it had a small range of salinities in the brackish range. This proposal deserves serious study.

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LETTERS TO THE EDITOR

Validity of the Isochron Age Procedure - Response to Brown

I still maintain that isochron age procedure for age dating of rocks is mathematically invalid for several reasons.

The first is that it uses a simple linear regression equation, which is valid only for ONE independent variable acting on ONE dependent variable. The isochron procedure has two independent variables, the ^{87}Rb radioactive parent and the common isotope ^{87}Sr of the atomic strontium. The dependent variable is the ^{87}Sr, but the end products of the two independent variables cannot be separated therein. Three variables are involved, so the Simple Linear Regression Equation (SLRE) output is invalid.

Also, the common isotope is about 7% by weight of the atomic strontium, whereas the daughter ^{87}Sr of the of radioactive ^{87}Rb is only in the order of 10^{-9} units of weight for each unit of parent weight; an unmeasurable quantity for a historical age of about 4000 years.

The multivariable linear division by a variable does not apply because the ^{87}Sr and ^{86}Sr are nearly colinear variables; the division of the ^{87}Rb and the division of the ^{86}Sr are quite different procedures as witness the totally different regression values before and after the division shown by Austin's data sets. The near colinearity also modifies the correlation coefficient too.

The meaning of the near zero slope of the regression is that there is essentially no correlation between the input X and Y values resulting from the division by ^{86}Sr.

As to Dr. Brown's use of the mixing line to bridge the gap between isochron an Biblical ages, it is not necessary if the isochron ages are invalid. The mixing line has no time significance at all.

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The Process of the Creation of the Universe

I am a layman as far as the sciences are concerned, but D. Russell Humphrey's book: *Starlight and Time* is in line with a question I have always considered to be fundamental in regards to the "apparent" age of the universe, which unless I have missed something, I have not seen addressed before. Specifically, the question is this: If the universe was created as a space-time-matter continuum in which neither aspect exists without the other two, then what was the effect on time (and therefore on atomic constants; the speed of light; decay rates, etc.), during the actual process of creation? In other words, was the universe created with the appearance of age, or rather, does the universe have the appearance of age *because* it was created? There is a big difference in the two when you consider that the universe was not created and completed in an instant of time, but required a number of 24-hour periods during which it was "stretched out" (Isaiah 40:22; 51:13; etc.). And those 24-hour time periods were the same as the time periods we live in today. They were the time periods in the mind of God which He adhered to, in anticipation of man and the completed creation, while "stretching out" the space-time-matter continuum to its, ordained limits.

It seems to me that this is the framework in which the question of the age of the universe needs to be worked out, of which Mr. Humphrey's book is a good example.

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Problems of Reaching the Truth under the Huxleyan Set of Rules

A list of regulations called the Marquis of Queensberry Rules is used in controlling action in today's boxing rings. These rules help facilitate a fair and humane match and ensure against serious injury should either boxer be unable to protect himself properly at any time.

In the struggle between Darwinism and its opponents the only standards of engagement that have been enunciated came at the time Darwinism was first launched. These norms were articulated by Darwin's formidable and prestigious supporter, Thomas Huxley. Huxley's forceful leadership carried widespread influence. He had a worldwide reputation in science and served as President for the British Association for the Advancement of Science.

Huxley set the tone for supporting Darwinism in whatever disagreements were likely to follow the publishing of Darwin's work. "I am Darwin's bull-dog" was his way of putting it. Also, "I am sharpening up my beak and claws in readiness." (Clark and Bales, 1966. p. 64).

Seen through the eyes of a boxer this set of statements would be interpreted as an *anything goes* signal. In a wrestler's view it would signify a *no holds barred* standard. Thus Darwinism came on the scene bound to an iron hand attitude of belligerence by Huxley and his followers.

There is no evidence that Darwin rebuked Huxley or refused to accept his type of support. Neither is there any evidence that Darwinists down through the years have seen anything wrong with adopting the domineering attitude of Huxley. A book could be written on the unhappy experiences of people who have run afoul the kind of heavy-handed treatment meted out by the Darwinist forces to those who would oppose them.

Most scientists are not schooled by their mentors in a Huxleyan, bull-dog, sharp-clawed way of dealing with scientific issues. Instead, most scientists believe that ideas in science should not be forced on anyone and that scientific viewpoints ought to be freely debatable without fear of recrimination.

Actually, Darwinism has been disadvantaged scientifically by the kinds of protection it has received. It has been impossible to give it the kind of debative winnowing that any controversial system of thought needs in order to test itself.

Darwin's evolutionism as a would-be supplier of some of the most basic of reality underpinnings - those having to do with living origins - has the potential for influencing societal attitudes and viewpoints. It includes religious fundamentals. It is important therefore that Darwin's ideas should have been sound because a faulty set of scientific principles is no more likely to beget excellent socio-political applications than would irrational arguments lead to logical conclusions. Or, as computer operators have put it: The quality of the results emerging from a computer will be no better than the quality of data fed into it.

To go on with this theme, it is a recognized fact that two of history's most massive and brutal social upheavals, namely Hitlerism and Stalinism, each in its own way put Darwin's thinking into practice. Seen in this light the mounting evidence that Darwinism is scientifically untenable takes on greater significance; and so does the need for making this fact known.

Critics of Darwinism have a long list of science-based questions which they would like to present to the evolutionist establishment for answers, if a way can be found to do so. These questions come from people whose scientific backgrounds are as complete as those of any of their evolutionist adversaries.

A final problem arises from the fact that scientists are not always the best situated nor the most experienced persons for championing issues of public concern. Journalists and people of the legal profession often tend by temperament and training to be better qualified. Fortunately we are seeing increased interest in the origins question on the part of persons in the field of law. Most of this kind of interest is needed; it bears on the well-being of our social order.

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ERRATA

All of the following changes are for Volume 34, Number 2, September 1997:

On page 87, page 81 was inadvertently reprinted. All recipients of the Quarterly were sent a paste-on page to correct this problem.

On page 94, line 41, change -globin to β -globin.

On page 102, the Koop et al. (1989) reference, change Tarsius β– and λ– globin...to *Tarsius* δ– and β– globin...

On page 103, second column near the bottom of the page, the denominators of the fractions are blank and should contain the Greek letter tau in all four instances.

On page 104, line 2, the inequality should read $t \geq \tau$.

A COMPARISON OF ANIMISTIC BELIEFS BETWEEN PAROCHIAL AND PUBLIC SCHOOL STUDENTS

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Abstract

A comparison is made between the willingness of parochial and public school students to accept animistic explanations for phenomena. The animistic views of 424 parochial high school seniors (class of 1994) were compared and contrasted with the animistic views of 1954, 1989 and 1992 introductory college biology classes. The distinctive difference between the public and parochial students was the public school students were taught evolution as a fact while the parochial school students were taught Biblical, young Earth creation as a fact. The parochial student groups showed similar animistic tendencies as the 1954 biology class. For the 1989 and 1992 public school group of students the animistic responses were double and even triple the responses given by the parochial and 1954 public school students. A statistically significant relation exists between the percent of students with a public school background at a parochial school and the willingness of the students at that parochial school to accept animistic explanations for phenomena. Taken as a whole, the data presented here seem to indicate that the teaching of evolution will result in students being more willing to accept animistic explanations for phenomena.

Introduction

Animism (from the Latin *anima*, "breath" or "soul") is the age old belief that an immaterial force (the *anima mundi* or "soul of the world") penetrates all matter giving to matter its form and movement ("Animism," 1994). As a philosophical theory, this immaterial force endows to all objects an inner or psychological being. Sociologists (Robertson, 1977, p. 368) classify animism as one of the four main religions (animism, supernaturalism, theism and abstract ideas).

> [Animism is a] kind of religion [that] recognizes active, animate spirits operating in the world. These spirits may be found both in people and in otherwise inanimate natural phenomena such as rivers, winds, mountains and the weather. These spirits are personified: they are assumed, like human beings, to have motives, will and emotions (Robertson, 1977, p. 368).

Primitive peoples pictured these spirits as phantoms, resembling vapors or shadows, which would transmigrate from person to person, from the dead to the living, and from and into plants, animals and lifeless objects. This ancient animistic philosophy was developed in ancient cultures, some believe, in an attempt to explain the causes of sleep, dreams, trances and even death. Ancients viewed these spirits not as gods to be worshipped but entities whose activities needed at least to be taken into account. These spirits may or may not respond to humans. The animistic spirits may be benevolent or evil or completely indifferent to humans (Robertson, 1977, p. 368).

Religious devotion to animistic theology appears throughout the cultures of ancient peoples as various forms of nature worship ("Nature Worship," 1994). The worship of fire is a common finding among primitive peoples with the most noteworthy being the ancient Parsis sect of Persia. The worship of celestial bodies is also a common occurrence. The Khoikhoi of South Africa worshipped the moon whereas the Iroquois, the Plains people, the Tsimshian people of North America along with the Native Americans of Mexico and Peru all worshipped the sun. The sun was a Hindu deity, the ancient Babylonians worshipped the sun and the ancient Egyptians worshipped the sun god, Ra. Other ancient Egyptian deities included the moon, the star Sirius, the circumpolar stars and various constellations.

Plants and trees have often been worshipped either as totems or as deity possessed objects (Saliba, 1994). As totems, the plants and trees took on a special significance between individuals or a social group who believed themselves to be linked with the totem in some way. Totems were common among the various Native North American tribes with the word "totem" derived from the language of the Ojibwa North American tribe. Totems also appeared in the cultures of ancient Peru, India and even primitive tribes and peasants of Europe. Even today traces of totemism may still be found in parts of Europe where field crops are often viewed as harboring spirits of fertility.

The devotion to natural objects to which supernatural attributes have been imputed is another common finding in ancient pagan cultures ("Fetishism," 1994). These objects, known as fetishes, are often figures modeled from clay, stone, wood, glass or other material usually in imitation of some deified animal or object. The fetish may be a tooth, a bone, a piece of hair or fur or sometimes the mummified animal itself. The fetish may be molded into the form of a tree, rock, river or some place which has particular spiritual significance. The fetish form of animism is particularly common among the peoples of West Africa.

Quite innocently, young children today will often hold animistic ideas. For them, this means that everything in the world is alive. Young children are often heard describing

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nighttime as the time when the sun goes to bed and morning the time when the sun wakes up. Children will say that Jack Frost paints the windows with frost and sends snow so they can play outside and build snowmen (Berger, 1988). Children's television shows regularly portray singing cows, sleepy flowers, talking trees, a laughing sun and dancing silverware. All this may be quite innocent with young children but it does become a problem when these idea are subtly carried into adulthood.

Previous Studies

In the Summer 1992 (Stewart, 1992) and Summer 1993 (Mickle, 1993) issues of *Creation/Evolution* two surveys were published on animistic beliefs among the introductory biology classes at Michigan State University and North Carolina State University. These two surveys presented some startling results. Professor Stewart from Michigan State University reported that from 1954 to 1989 "the animistic responses doubled and tripled, not decreasing in any instance" (Stewart, 1992, p. 18). Professor Mickle from the University of North Carolina wrote "the results I obtained were remarkably similar to the 1989 results of Stewart" (Mickle, 1993, p. 42). Mickle went on to report "many, in some cases [the] majority of students surveyed showed a general tendency to accept animistic explanations for phenomena" (Mickle, 1993, p. 43). The results obtained by Mickle and Stewart are discouraging but they are not surprising.

Why the Change? A Possible Explanation

Any student studying the biological science today will quickly recognize that evolution is a unifying principle of the biological sciences. However, this was not always the case. Bentley Glass wrote in 1949:

> When all is said, evolution remains the great unifying principle of modern biology. Nevertheless, it has not been too fashionable in the past three decades [1920s-1940s] to make it the central theme in elementary college courses in that subject, at least in the United States (Glass, 1949).

Evolution was widely accepted by the scientific establishment as a unifying biological principle during the decades of the 1920s through 1940s yet it was apparently not taught as such to biology students. During the first few years of the 1950s biology textbooks did not cover the biological sciences as being tightly woven with the theme of evolution. Glass writes that "teachers of biology should therefore welcome such a textbook" (Glass, 1949).

Wolfgang Pauli wrote in the introduction to his 1949 biology textbook:

> Biologists unanimously agree that the one unifying principle which underlies the whole field is that of evolution. It appeared to me some years ago that the logical way to teach the course in general biology would be to use this principle as a guiding theme. Surprisingly enough, however, there were, and are, no modern textbooks written primarily from this point of view (Pauli, 1949, vi).

In accordance with this, the average biology student in 1950 was not taught biology under the unifying theme of evolution. Evolution was certainly taught to students at that time, but its presentation as the grand unifying principle of biology is a phenomena only of the last four decades.

Evolution has at its heart the idea that everything in the universe came into being by some natural process - no outside agency was active or for that matter even necessary. At some point in time during the development of the universe inanimate matter gave rise to animate matter. In other words, nonlife gave rise to life. Evolution requires that at some distant point in the past nonliving matter gave rise to living matter.

A question arises as to whether this increased emphasis on evolutionary teachings resulted in the doubling and tripling of animistic responses among public school students. The purpose of this paper is to the explore the possibility that students who are taught evolution will have an increased tendency to hold animistic beliefs compared to students who are taught creation. The survey distributed by Professors Mickle and Stewart to their public school biology students was also distributed by this author to parochial high school students who were specifically taught Biblical Creation (six literal 24 hour days of creation, a universe < 10,000 years old, etc.). The parochial school results obtained are compared to the public school results of Mickle and Stewart.

Data Accumulation

The Wisconsin Evangelical Lutheran Synod (WELS) was founded in 1850 by congregations in and around Milwaukee, Wisconsin. The Synod's 400,000 baptized members are found in congregations throughout the United States and Canada with a very high percentage of its churches concentrated in Wisconsin, Minnesota and Michigan. The WELS is conservative in its doctrine confessing the Bible to be the verbally inspired word of God. The WELS confesses a young Earth creation doctrine and rejects "the theories of evolution as an explanation of the origin of the universe and man, and all attempts to interpret the Scriptural account of Creation so as to harmonize it with such theories" ("This we believe, A statement of belief of the Wisconsin Evangelical Lutheran Synod." 1967). The WELS places a large emphasis on education with a Seminary, two colleges, two high school preparatory schools, 21 area Lutheran high schools and 361 Lutheran elementary schools.

Eleven WELS high schools participated in this study. The schools that participated were Michigan Lutheran Seminary in Saginaw, Michigan, Arizona Lutheran Academy in Phoenix, Arizona, Martin Luther Preparatory School in Prairie du Chien, Wisconsin, Huron Valley Lutheran High School in Westland, Michigan, Winnebago Lutheran Academy in Fond du Lac, Wisconsin, West Lutheran High School in Hopkins, Minnesota, Saint Croix Lutheran High School in St. Paul, Minnesota, Northland Lutheran High School in Wausau, Wisconsin, Fox Valley Lutheran High School in Appleton, Wisconsin, Evergreen Lutheran High School in Kent, Washington, and Wisconsin Lutheran High School in Milwaukee, Wisconsin.

The questionnaire which was used by Mickle and Stewart and distributed to the 11 WELS high schools is reproduced in Figure I. The teachers to whom this questionnaire was sent were instructed to distribute these questions to the entire senior class. The teachers were instructed not to inform the students that this was a quiz on animism. The teachers were asked to give the questions to the students without any preface other than to ask them to answer the questions with what they honestly thought to be the best answer. The teachers were free to tell the students that they were taking part in a study and that they would be informed of the results.

The teachers were also asked to provide information on the amount of science training the students had received prior to the time of taking this quiz including their exposure to evolutionary theories. They were also asked to provide information on whether animism was discussed in any class prior to the students answering these questions, and if so, in what context where the students exposed to animistic ideas. The teachers were also asked to provide an estimate of the percentage of students taking the test which came from a public school background (high school and/or elementary school).

Results and Discussion

The results obtained from this survey are given in Table I. The results for each question are given as the percentage of students answering each question. The correct, or non-animistic, answer to each question is E. In Table I, the column labeled T is the total results for all 11 WELS high school senior student groups. The columns labeled 54, 89 and 92 are the data collected by Mickle and Stewart. The 54 and 89 data were collected from students that had just completed an introductory biology course at Michigan State University. The 92 data was the result of a survey of students in a general biology class for non majors at North Carolina State University. The majority of students in the 92 data majored in humanities, social sciences and business with a few majoring in engineering and the life sciences.

The results of each student group from Table I were quantified by determining an animistic score for each school. The results of this calculation are given in Table 11. The animistic score for each school was calculated by assuming the answers for each question from A to E were in order of decreasing animistic bias. It is uncertain if the circumstances behind the original quiz allow such an arrangement but it does appear reasonable that they are arranged in such an order. The score for each school for a particular question was determined by multiplying the percent responses for A by 0, the percent responses for B by 1, the percent responses for C by 2, the percent responses for D by 3 and the percent responses for E by 4. These numbers were then summed with the total divided by 100. Scores for the individual questions ranged from 0.0 to 4.0. The higher the tendency a group showed towards animism the lower their score. If a student group answered all E for a particular question then their score for that question would be 4.0, The average score for each question for each school was calculated in this manner. The total score and the standard deviation for each school was calculated by averaging the scores for the five questions. The combined score for each question for all 11 WELS student groups along with a total score for the WELS students were also determined. These are given as column T in Table II.

From Table II, the average score for the WELS student data set was 3.4±0.2. The low score for a group of parochial school students was 3.0 with three schools having the high score of 3.7. The public school scores were 3.6±0.2 and 2.8±0.3 for the 1954 and 1989 biology classes at Michigan State and 3.1±0.2 for the 1992 biology class at North Carolina State. A one-way analysis of variance was conducted to determine if there was a statistically significant difference between these three groups. The results of this are given in Table III.

There was no statistically significant difference (at the 95% confidence interval) between the WELS group of students and the 1954 biology class at Michigan State University. The WELS students had an average score of 3.4 with the Michigan State students an average score of 3.6. There was a statistically significant difference (at the 95% confidence level) between the WELS group of students and the 1989 biology class at Michigan State (average score of 2.8) and the 1992 biology class at North Carolina State (average score of 3.1).

These results are interesting. The WELS student groups showed similar animistic tendencies as the 1954 biology class at Michigan State. For the 1989 and 1992 public school group of students the animistic responses were double and even triple the responses given by the WELS and the 1954 public school students. In some cases (particularly questions 3, 4 and 5), the majority of the 1989 and 1992 public school students surveyed showed a general tendency to accept animistic explanations for observed phenomena (Table I). There were no regional differences as the student bodies came from Michigan, North Carolina, Minnesota,

Table I. Animism survey results. Results given as a percentage of students answering each question. The last row of the table is the number of students at each school that responded. Key to table is given at the end of the table.

Q#	MS	AR	MP	HV	WL	WS	SC	NL	FV	EL	WH	T	54	89	92
1a	4	0	2	0	0	0	3	0	2	0	2	2	0	16	10
b	8	0	2	7	7	0	3	0	2	7	12	7	0	5	8
c	4	5	5	26	3	0	17	7	4	0	6	6	13	17	14
d	0	0	8	0	0	0	0	0	0	0	0	1	0	0	1
e	84	95	83	67	90	100	77	93	92	93	80	84	88	62	67
2a	10	0	5	7	3	0	0	0	4	0	4	4	0	6	7
b	2	0	2	7	3	0	0	7	0	7	3	2	8	8	3
c	2	5	5	13	4	0	3	7	0	0	5	4	3	12	10
d	0	0	5	0	0	0	8	0	0	0	2	2	0	1	3
e	86	95	83	73	90	100	89	86	96	93	86	88	90	73	77
3a	8	0	7	13	10	0	17	0	4	0	16	10	3	14	7
b	0	0	5	0	7	0	11	7	2	13	4	4	3	8	7
c	4	5	5	7	0	0	3	0	0	0	2	3	8	11	11
d	16	43	7	27	7	25	19	14	9	20	17	16	30	41	25
e	72	52	76	53	76	75	50	79	85	67	61	67	57	24	50
4a	0	5	2	13	3	0	0	0	0	0	1	1	0	3	1
b	21	5	22	33	10	17	17	0	8	7	16	16	0	23	19
c	11	23	5	0	18	8	14	14	9	7	12	11	11	17	15
d	12	19	0	14	3	8	8	14	0	26	7	8	15	26	26
e	56	48	71	40	66	67	61	72	83	60	64	64	75	30	39
5a	5	0	10	7	3	0	8	0	0	0	7	5	0	6	4
b	4	0	0	13	7	0	11	0	4	7	5	5	0	6	6
c	12	10	2	13	4	8	4	0	2	0	9	7	5	14	13
d	7	19	12	7	0	17	8	29	7	13	8	9	45	37	21
e	72	71	76	60	86	75	69	71	87	80	71	74	50	35	56
size	57	21	42	15	29	12	36	14	46	15	137	424	NA	100	220

MS: Michigan Lutheran Seminary
AR: Arizona Lutheran Academy
MP: Martin Luther Preparatory School
HV: Huron Valley Lutheran High School
WL: Winnebago Lutheran Academy
WS: West Lutheran High School
SC: Saint Croix Lutheran High School
NL: Northland Lutheran High School
FV: Fox Valley Lutheran High School
EL: Evergreen Lutheran High School
WH: Wisconsin Lutheran High School
T: Total WELS Schools surveyed
54: 1954 biology class at Michigan State University
89: 1989 biology class at Michigan State University
92: 1992 biology class at North Carolina State

Table II. Animism survey results. See Table I for school abbreviations. The score for each question was calculated as follows: [(Q1*0)+(Q2*1)+(Q3*2)+(Q4*3)+(Q5*4)]/100. The average (avg.) is the average score for that school and the standard deviation (std.) is 1 standard deviation.

Q#	MS	AR	MP	HV	WL	WS	SC	NL	FV	EL	WH	T	54	89	92
1	3.5	3.9	3.7	3.3	3.7	4.0	3.5	3.9	3.8	3.8	3.4	3.6	3.8	2.9	3.1
2	3.5	3.9	3.6	3.3	3.7	4.0	3.9	3.7	3.8	3.8	3.6	3.7	3.7	3.3	3.4
3	3.4	3.5	3.4	3.1	3.3	3.8	2.7	3.7	3.7	3.4	3.0	3.3	3.4	2.5	3.0
4	3.0	3.0	3.2	2.4	3.2	3.3	3.1	3.6	3.6	3.4	3.2	3.2	3.7	2.6	2.8
5	3.4	3.6	3.4	3.0	3.6	3.7	3.2	3.7	3.8	3.7	3.3	3.4	3.5	2.9	3.2
avg.	3.4	3.6	3.5	3.0	3.5	3.7	3.3	3.7	3.7	3.6	3.3	3.4	3.6	2.8	3.1
std.	0.2	0.4	0.2	0.4	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.2

Table III. One way analysis of variance. Variance is $1/N^{th}$ the sum of the squares minus the square of the mean. Sum of the squares is the sum between groups (between) and the sum within each group (within). F is the model mean square (mean square between groups) divided by the error mean square (mean square within group). P is the probability of obtaining (by chance alone) an F value greater than the one calculated if there is no difference between the group means. A P value <0.05 (95% confidence interval) is generally considered evidence of a significant difference. F critical is the critical value of F for P = 0.05 at F(l,8).

Groups	Mean	Variance	Sum of squares	Mean Square	F	P	F critical
T	3.42	0.04	between = 0.08	between = 0.08	2.0	0.19	5.3
54	3.60	0.03	within = 0.31	within = 0.04			
T	3.42	0.04	between = 0.95	between = 0.95	13	0.01	5.3
89	2.81	0.10	within = 0.56	within = 0.07			
T	3.42	0.04	between = 0.25	between = 0.25	5.8	0.04	5.3
92	3.11	0.04	within = 0.35	within = 0.04			

Table IV. Relation between the percentage of students at a school (see Table I for school abbreviations-only these 8 schools provided this information) with a public school background and that school's average score for each of the five questions and their total average score. The rows at the end of the table labeled CorrCoeff give the linear correlation coefficient between the % students with a public school background and the average score for each question. CorrCoeff (all) is for all 8 schools, CorrCoeff (≥ 3%) is for the 7 schools with at least 3% of the students with a public school background, etc.

% students with public school background	Question 1 avg. score	Question 2 avg. score	Question 3 avg. score	Question 4 avg. score	Question 5 avg. score	All Questions avg. score
0% (WL)	3.7	3.7	3.3	3.2	3.6	3.5
3% (WH)	3.4	3.6	3.0	3.2	3.3	3.3
8% (WS)	4.0	4.0	3.8	3.3	3.7	3.7
10% (HV)	3.3	3.3	3.1	2.4	3.0	3.0
12% (NL)	3.9	3.7	3.7	3.6	3.7	3.7
19% (AR)	3.9	3.9	3.5	3.0	3.6	3.6
19% (MP)	3.7	3.6	3.4	3.2	3.4	3.5
25% (MS)	3.5	3.5	3.4	3.0	3.4	3.4
CorrCoeff (all)	0.07	-0.11	0.28	-0.14	-0.03	0.10
CorrCoeff (≥ 3%)	0.11	-0.08	0.24	-0.09	0.12	0.17
CorrCoeff (≥ 8%)	-0.22	-0.19	-0.25	-0.03	-0.05	-0.01
CorrCoeff (≥ 10%)	0.10	0.26	0.15	0.15	0.26	0.29
CorrCoeff (≥ 12%)	-0.84	-0.45	-0.89	-0.89	-0.83	-0.95

Choose the best answer for each question.

1. Many ships are at the bottom of the sea. We cannot find them. Do you think the sea itself knows where they are?
   a) Yes, because the chemicals of the sea come into contact with them and know where they are.
   b) Yes, because the sea rubs over them and knows them to be there.
   c) Probably not because the sea has no nerves of its own.
   d) No, there are so many sunken ships, the sea could not keep track of them all.
   e) No, the sea is incapable of knowing anything.
2. When an automobile tire blows out, does the tire feel anything?
   a) Yes, the tire feels the great and sudden reduction of pressure.
   b) Yes, the rubber molecules are very active and feel the rending and tearing.
   c) Probably not, the rubber in the tire has been dead for a long time since it was part of a tree.
   d) No. Once a tire blows out it is too dead to feel.
   e) No, an automobile tire cannot feel anything.
3. When a plant is cut off, it wilts. Does the plant feel depressed when this happens to it?
   a) Yes, its gradual reduction of living forces makes the plant suffer.
   b) Yes. The cells shrink and become dry and cause a depressed feeling.
   c) Probably, but only in a very dim sort of way.
   d) Probably not, plants do not have consciousness, at least to this degree.
   e) No. Such feelings are not possible for plants.
4. Is the sun in any way living?
   a) Yes, because it gives off flames which indicate life.
   b) Yes, because it gives forth energy which makes life possible on earth.
   c) Yes, it is not breathing, but it is pulsating, ever-changing and therefore living.
   d) Probably not. It is doubtful that the sun shows any manifestations of life.
   e) No. It is not in any way alive.
5. The natural oyster pearl was once in a shell in the sea. When the water moved over it could the pearl feel the movement?
   a) Yes. It was a growing thing, much like a fetus in a mother's womb.
   b) Yes. The pearl was part of a living thing.
   c) Probably, but only indirectly through the senses of the oyster.
   d) Probably not. A pearl is just a kind of growth like a tumor.
   e) No. A pearl could never feel anything.

Figure 1: Animistic quiz distributed to all students (Stewart, 1992).

Wisconsin, Arizona and Washington so the indicated beliefs by the students are widespread.

The data in Table IV examines the relation between the percentage of students with a public school background (high school or elementary school) at a particular WELS school and that schools average score for each of the five questions and the school's total average score. A student had no public school background if their entire schooling was from a parochial school (in almost every case a WELS elementary school). A student was considered to have had a public school background if they had a minimum of one elementary or high school year spent in a public school. The first column in Table IV lists the percent of students with a public school background that participated in the quiz for each school. Unfortunately, not all of the WELS schools that participated in this study provided this information. At the bottom of Table IV is given the linear correlation coefficients between the percent students with a public school background and the average score for each question and the average score for each school for all five questions. The row labeled CorrCoeff (all) is the linear correlation coefficient using all eight schools in Table IV. The row labeled CorrCoeff (≥ 3%) is the linear correlation coefficient for the seven schools with at least 3% of the students having a public school background.

From Table IV, there was a statistically significant relation between the percent of students with a public school background and a school's animistic score for those WELS schools where at least 12% of their student body had a public school background. The general relation which was observed was as the percent of student with a public school background increased, the school received a lower score. In other words, as the percent of public school students increased, the student body showered a greater tendency to accept animistic explanations for phenomena. This result is consistent with the data already presented showing public school students to have a higher tendency towards accepting animistic explanations for observed phenomena.

There are two main differences between the education received by the public school and WELS students in this study. First, the WELS students all had at least two years of general science courses and in these courses they are introduced to evolution as an incorrect view of the origin of life on earth. These students are all taught Biblical creation from the perspective that the universe and all life was created by God no more than 10,000 years ago in a series of created acts that took place over six literal 24 hour days. The WELS has remained unwavering in its stand and teaching of creation throughout its 150 year history. Second, the WELS students are introduced to pagan animistic religions in their study of world religions so may have had more exposure to animism than the public school students. Because of this latter fact, the data presented here may not be sufficient to quantify the effect that the teaching of evolution has had on a students' willingness to accept animistic explanations for phenomena.

The interesting comparison is between the WELS group of students and the 1954 public school biology class. There was no statistically significant difference between these two student groups in their acceptance of animistic explanations for phenomena. In 1954, the teaching of evolution as the grand unifying theory of biology was in its infancy (Pauli, 1949, vii). Evolution was taught in public schools in 1954 but the level of vigor with which it was taught is unmatched by the increased level of today. The concepts that a tire would have feelings or that sea was intelligent were odd concepts to both the public and parochial class of 1954. This does not seem to be the case today with the public school classes. Taken as a whole, the data presented here seem to indicate that the teaching of evolution will result in students being more willing to accept animistic explanations for phenomena.

Conclusions and Future Work

Heinz Pagels (late director of the Academy of Sciences) wrote that "70% of all U.S. college undergraduates believe in some kind of psychic or supernatural forces lying outside of natural science" (Pagels, as quoted in Stewart, 1992, p. 18). Pagels blamed this in part on the impaired scientific state of television, books and magazines. This may indeed be true. However, this study does indicate that there is a significant difference between the "supernatural forces" beliefs of public versus parochial school students and that this difference may be due to the teaching of evolution.

The results of this study were very interesting. In order to obtain a fuller understanding of the relation between the teaching of evolution and animistic ideas in students this study will need to be expanded. The author encourages all readers of this journal who are teachers to give this quiz to their students. It would be interesting to include with the five animistic questions an additional question inquiring of the student's view of origins. An example of a question that could be used is as follows:

6. What is your personal view of the origin of the earth and life on earth?

A. The earth and all life were created by God over six literal 24 hour days no more than 10,000 years ago.

B. The earth and all life were created by God over the course of millions of years.

C. The earth formed and all life appeared without the assistance of any God.

Comparing how a group of students answer the above question 6 with their animistic score for the entire quiz may provide more insight into the role evolution has played in shaping an individuals willingness to accept animistic explanations for phenomena.

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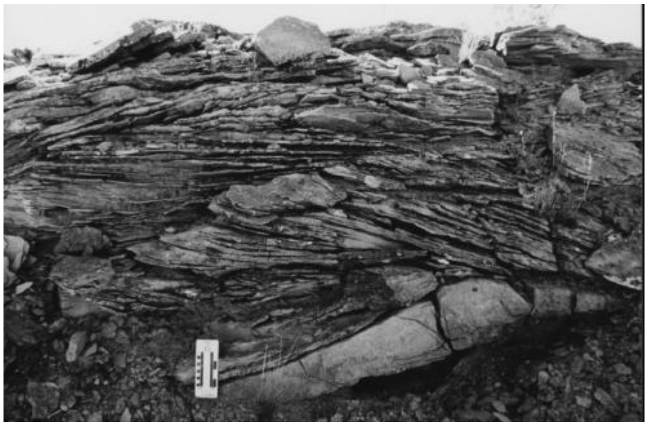
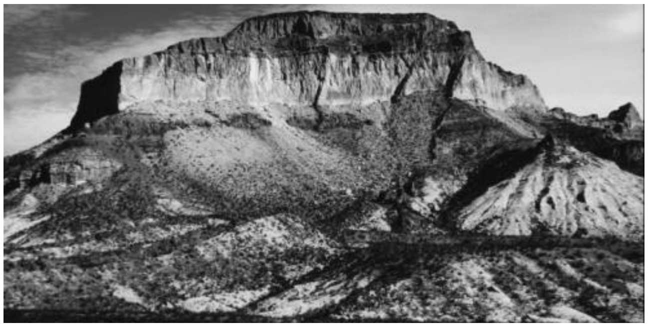


Large-Scale Cross-Bedded High-Energy Flood Deposits*

This photograph illustrates the large-scale high-angle cross-bedding of the Big Yellow Sandstone Member found within the Big Canoe Valley, Big Bend National Park, Texas. Based on this outcrop and a few others found nearby uniformitarians have recreated a river environment within this small area. This pseudo-environment exists only in the minds of the uniformitarian scientists in their version of Earth's distant past (more than 35 million years ago!) The global uniformitarian stratigraphic column is built on just this sort of extrapolation!

Due to the close proximity of volcanoes and their associated high-energy environment, it would not be unreasonable to interpret the sands and their cross-bedding as being derived from the former activity of the nearby volcanoes in combination with reworking from Floodwater. This creationist interpretation eliminates the need for vast amounts of time and any pseudo-environment involving theoretical rivers. The Flood Event Timeframe would have provided sufficient geologic energy to create and form these sandstone cross-beds in the manner that we observe them today.



Igneous Dikes at Three-Dike Hill*

Three-Dike Hill is a large mountain found along the Rio Grande River south of Redford, Texas. It is 3,430 feet high. It exhibits three dikes running vertically up the side of the hill shown in this photograph. Note that one is in the center of the hill and the other two are to the right side. A dike wall lies along the bottom of the hill (from left to right) and extends into the dike on the far right side of the hill.

Three-Dike Hill was originally identified in a report of the area documenting the United States and Mexico boundary in 1852. It has been studied by geologists and astronauts since this time.

Presently, Uniformitarians interpret this mountain block as being somewhat stable during the injection of the magma generated dikes. Following this event the surrounding area sank, thus exposing this outcrop. Uniformitarians acknowledge that much remains unexplained within their present theory.

Creationists might interpret this mountain as reflecting Flood deposited sediments which were later subjected to volcanic events (found throughout this area) resulting in uplift and erosion - all possibly still under the Floodwater. Tectonism coupled with receding Floodwaters created conditions of block rotation and erosion sufficient to result in the exposure of the Three-Dike Hill. This mountain may contain key information regarding the volcanic processes which occurred during the Flood within the Rio Grande River Valley. Further investigation is necessary to determine the significance of this mountain and its dikes within the biblical framework.

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*Both of these photo essays are by Carl R. Froede, Jr, 2895 Emerson Lake Drive, Snellville, Georgia 30078-6644.

LETTERS TO THE EDITOR

Concerns about "The Fine Tuned Watch Revealed in the Delicate Balance of Earth's Forces" - A Reply to Jerry Bergman

We who write scientific material for creationist literature are constantly in danger of making statements that do not reflect favorably on the cause we seek to defend and promote. The topics of concern are so diverse and so complex that any single individual who attempts to write beyond a narrow range of expertise, or in analytical detail, is at high risk for making a statement that depreciates his credibility. I personally must express regret for some statements in material that has been published over my name. The more extensive an individual's writings, and the broader the range they cover, the greater is the likelihood that they contain some portion that reflects unfavorably on the author's credibility or reliability. An illustrative example is provided by "The Fine-Tuned Watch Revealed in the Delicate Balance of the Earth's Forces" on pp. 80-88 of *CRSQ* 33(2).

In the paragraph ending on p. 83, lines 2-4 contain the statement "The Earth gains rotational energy from sources which include the ocean tides"; yet in the following paragraph lines 5 and 6 specify that the "collision [of high tides with continental borders] causes Earth to lose rotational energy." Are tides associated with gain or loss of rotational energy? Cyclic tides are associated only with loss of energy.

The near passage of a large extraterrestrial object would cause tidal deformation, which in turn would result in a torque that produced a small increase of Earth's rotation rate about an axis perpendicular to the plane containing the Earth and the path of the passing object. The *next* near-passing object would be expected to produce an increment of rotation change about a different axis, including the possibility of reversing the change produced by the preceding object. But what astronomical data indicate that there have been such encounters? Any gravitational interaction between Earth and the other planets would have had a negligible effect on Earth's rotation rate over a 10,000 year span since Creation Week.

Regarding lines 11-13 of the first paragraph beginning on p. 83, we can ask, what "measurements ... indicate new sources of kinetic energy [of Earth's rotation] are being added by the motion of the solar system"? How can precise timing measurements which indicate that the length of the Earth day has increased by about two milliseconds per century be considered as support for the proposal that Earth has been gaining rotational energy? (An increase in the absolute time length of the day is associated with a decrease in rotation rate/energy.) Since the proposal that Earth's rotational energy has been increasing is a major consideration of this article, adequate supporting theoretical foundation and observational documentation should be given. The "motion of," or the motions within, the solar system that are claimed to cause the rotation rate of planet Earth to increase should be specified.

In the last paragraph on p. 85 there is an assertion that "The Earth is the only inner planet that has a large enough satellite to achieve [a 23°] axis tilt." Note the following data for degrees of rotation axis tilt with respect to the revolution axis (see p. 14-3 of the 75th edition of the (RC Handbook of Chemistry and Physics). (The minus sign refers to reverse rotation axis.)

	Tilt of Rotation Axis		**Rotations/Revolution**
Mercury	0		1.50
Venus	177.3	(-2.7)	0.926
Earth	23.45		366.25
Moon	6.68		1.000
Mars	25.19		669.6
Jupiter	3.12		
Saturn	26.73		
Uranus	97.86	(-82.14)	
Neptune	29.56		
Pluto	118	(-62)	

The Moon's revolution axis is tilted about 5° with respect to the axis of Earth's revolution about the Sun.

If the Moon stabilizes Earth's 23.45° axis tilt, what "stabilizes" the tilt of Mars? What "Research indicates that without the moon's effect, the Earth, like the other inner solar system planets including Mercury, Venus, and Mars, would tilt as much as 85° off vertical with the plane perpendicular to the Earth's orbit around the Sun" [lines 6-11 of last paragraph on p. 85]?

Elementary consideration of the relationship between kinetic energy and tidal interaction (due to both mobility of liquid and flexibility of solid structure) indicates that the trend is toward revolution of Earth and Moon about their common center of mass with parallel axes of rotation, and each maintaining the same face toward the other (as the Moon does toward Earth). In such a relationship there is one rotation of each object per revolution about the center-of-mass axis, and there are no tides or torques that further reduce kinetic energy of rotation. The trend to the ultimate relationship is now illustrated by the inclinations and rotation rates of Mercury and Venus in their revolution around the Sun.

The literature cited by Dr. Bergman treats theoretical speculation concerning the development of the Solar System from a presumed chaotic initial relationship when there was condensation from gas to solid objects at an evolutionary beginning about 4.5 billion years ago. Various stages in the presumed evolution from chaos to the present relationships are measured in millions of years. Out of this literature we can sift insights that improve our understanding of the Solar System as presently observed, and which enable us to estimate changes that may be discernable millions of years in the future; but regarding 10,000 or less years of history since Creation Week the testimony of celestial mechanics is that there have been no significant changes in the Solar System.

In making these comments I do not want to depreciate the large portion of sound, beneficial content in Dr. Bergman's treatment.

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A Response to Dr. Robert Brown Concerning Earth's Forces

The main concern of my paper was to look at the balance of forces that produced stability in the earth's various movements and cycles. The research which I reviewed indicated that the energy added to the earth closely balanced its losses, and that the current state of the research and measurements "indicate" this balance (Richards et al., 1997). One source is gravitational which not only produces tides, but also has an effect upon the earth's motion itself. The inference I was making was that the gains due to factors such as the motion of the solar system evidently helped to offset some of the losses. The net effect is the gain and loss is very close, as the calculation of two milliseconds loss of rotational energy per century indicates (Ward, 1992).

To say we "know" that a general steady state exists in respect to this balance might be too strong a term, but I believe that this is a reasonable conclusion from what is now known. An example is the relationship between projections above the mantle and those below which facilitate achieving balance. One reference I used was a review by Yale Professors Drs. Skinner and Porter. I concluded that there exist many mechanisms which facilitate achieving the general balance, even though the researchers cannot always explain all of the forces that contribute to the complex balance found. I did not go into more detail in this area partially because this topic is appropriate for an entire article. I would classify this conclusion somewhere between a proposal and a firmly established relationship because data has not been collected for a long enough period of time to classify it as firmly established.

The statement that the earth is the only inner planet that has a large enough satellite to achieve a stable 23° axis tilt was a summary of the research I consulted. Since I was only referring to the inner planets, data on Jupiter, Saturn, Uranus, was not considered. Also as to the influence of the moon on the axis tilt, only earth was discussed, and with Mars a different set of relationships exists both for its moons and in the solar system (Comins, 1993). Mars has two moons (Deimos and Phobos), both which are smaller than the earth's moon and which no doubt also help to stabilize Mars' tilt. Mars, though, is much smaller than earth and it has a tilt close to that of the earth (25°) but is evidently less stable. The physics of satellite planet rotational dynamics must take into account the fact that a planet rotates as a planet-satellite system and the axis of rotation is not the center of the planet, but the gravity center of the planet satellite system (Zdenek, 1979).

The problem with these calculations is that many are based on estimates, many of which have changed slightly because of the data collected from the recent space probes. This is one reason why I used the term "apparently" when discussing the 23° axis tilt. Stable is a relative term: if little measurable change has occurred in the past 100 years, is this stable? Murray noted that:

> ...the obliquity of Mars is still undergoing large, chaotic variations [and] the Earth has been saved from a similar fate by the stabilizing influence of the Moon-the only large satellite in the inner Solar System. The Earth has a modest obliquity of 23.5° but the resulting seasonal variations are sufficient to cause the annual migration of some of its inhabitants. The spin axis precesses in space at a current rate of about 50 seconds of arc per year and the obliquity varies by ±l/3° with a mean value of 23.3° [and]...the eccentricity of the Earth's orbit also changes in response to planetary perturbations...(1993, p. 586).

Laskar, Joutel and Robutel concluded that:

> the Moon is a climate regulator for the Earth. If it were not present, or if it were much smaller, for many values of the Earth primordial spin rate, the obliquity of the Earth would be chaotic with very large variations, reaching more than 50° in a few million years and even, in the long term, more than 85°. This would probably have drastically changed the climate on the Earth [so it could not support life] (1993, p. 617).

Obviously some of what I noted may or may not eventually prove to be completely correct. A concern is "has it been proven to be incorrect now?" My major point was, as Dr. Brown eloquently stated "the testimony of celestial mechanics is that there has been no significant changes in the solar system...since creation week." I did not mean to imply that there was and my focus was on the balance of forces, meaning that losses as well as gains occur.

Nonetheless, Dr. Brown's concerns are well taken and it would have been useful to have them raised when I was working on the article. I perceive a handicap creationists have is that they often enjoy less communication with colleagues before publication. In the secular world, at least the universities I have been part of, articles are sent to as many as a dozen or more colleagues for feedback. By the time an article is sent to a journal, it is fairly tight. I have perceived this does not tend to take place as much among creationist scholars.

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Population Growth

According to the "Quote: Populations" item in your December 1996 issue (p. 229), a minimum of 50 breeding adults is necessary to avoid genetic problems and sustain a population, and 500 to sustain a population over a long period of time (the "50/500" rule). The comment was made that "Minimum population requirements present an unanswered challenge to evolution in general..." This may be true, but the creationist who uses this argument against the theory of evolution should be aware that the evolutionist might point out that the 50/500 rule poses a challenge to the Genesis account, as well.

According to Genesis, all living, land-dwelling creatures are descendants of the creatures that were carried in the ark. This means that they can be traced back to an original breeding population of a mere seven (clean) or two (unclean) individuals - far below the 50/500 requirement.

Of course, an original population of seven, or even two, is a whole lot better than an original population of one, which the evolutionist is forced to postulate. Furthermore, the creationist may plausibly suggest that the 50/500 rule did not apply in Noah's day, since the creatures on the ark (and their ancestors) had enjoyed the protection of the vapour canopy and so probably had much less corruption in their DNA than creatures now living.

Thus, the 50/500 rule is not an insurmountable problem for the creationist view, and it is certainly less of a problem than it is for the evolutionist.

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Canyon Formation by Solution and Collapse of Limestone - Trans-Pecos Texas

Introduction

The development of Santa Elena Canyon, Big Bend National Park, Texas recently has been examined from a creationist perspective (Williams and Howe, 1996, pp. 86-96). The authors mentioned that the formation of solution cavities or caverns in limestone with subsequent collapse of the roofs of these features could have been a viable mechanism for the development of the canyon, particularly the lower seven-mile length (p. 95). More evidence of solution-collapse features in the southern region of Trans-Pecos Texas is presented to reinforce this possibility.

Location of Solution-Collapse Feature

Where an intermittent stream, Contrabando Creek, exits the Terlingua monocline, an amphitheater* (Figure 1) has been created in Santa Elena Limestone by the processes of solution and collapse. This amphitheater is located approximately four miles north of Lajitas, Texas within Big Bend Ranch State Park (Figure 2). Also Santa Elena Limestone caps the walls of Santa Elena Canyon in the lower, narrow-walled, seven-mile section (Williams and Howe, 1996, pp. 90-92).

Possible Mechanism of Solution and Collapse

The uplifted Terlingua monocline contains several faults which likely led to the fracturing of the capping limestone (Henry, 1996). Considerable post-Flood precipitation during a warm ice age (Williams and Howe, 1993, p. 50; Williams and Howe, 1996, p. 94) could have caused the solution of limestone in these fractures producing a cave or cavern along which is now the path of Contrabando Creek through the monocline. The roof of this cave system collapsed forming the amphitheater. Much of the course breccias from the collapsed roof remaining on the floor of the amphitheater have been cemented together by reprecipitated calcite (Figure 3).

Likewise faulting in Santa Elena Limestone is evident along Mesa de Angulia which forms the wall of the narrow lower portion of Santa Elena Canyon on the American side of the Rio Grande (Williams and Howe, 1996, p. 93). Thus a similar solution-collapse mechanism on the uplifted fault blocks of limestone could have been instrumental in forming a canyon at that location through which the Rio Grande now flows.

Appendix: Origin of the Name, Contrabando

During the early 1900's, some of the Big Bend inhabitants on both sides of the Rio Grande considered the tariff laws to be unjust, and they began dealing in all

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*Amphitheater - an erosional indentation in a cliff face.

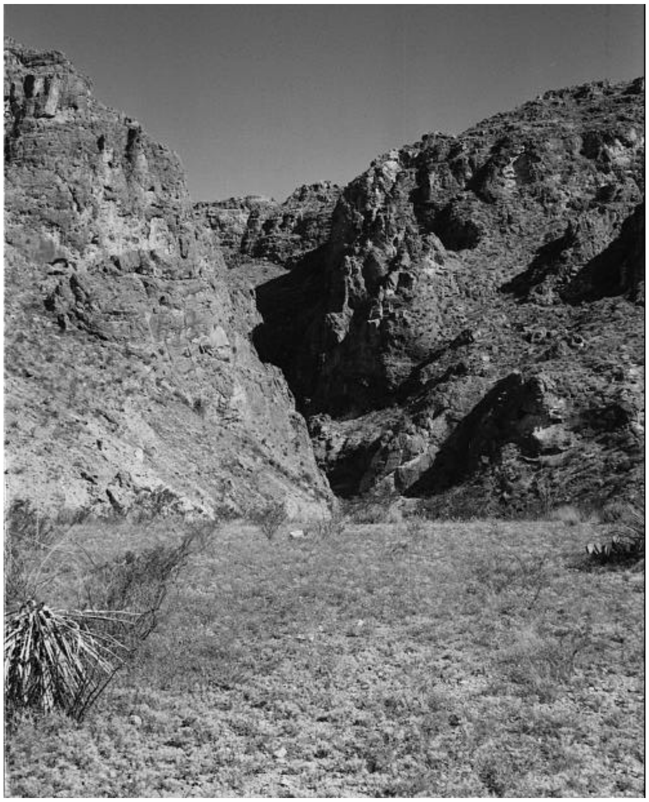

Figure 1. Amphitheater in Terlingua monocline, north of Lajitas, Texas, walls consist of Santa Elena Limestone. The stream bed of Contrabando Creek as it leaves the canyon is along the base of the wall to the left of the figure. The height of the limestone walls at the amphitheater is approximately 400-600 feet.

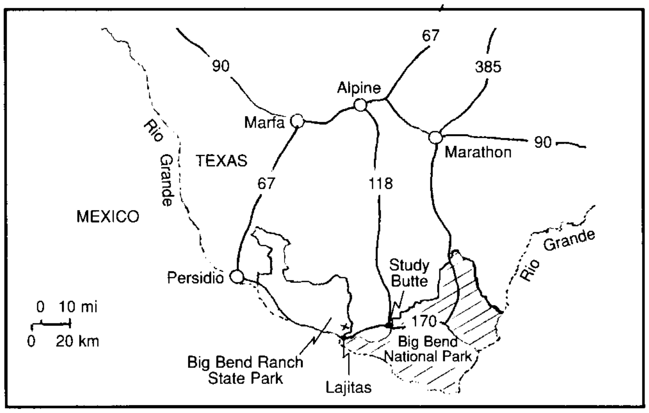

Figure 2. Location (x) of amphitheater in Terlingua monocline north of Lajitas, Texas within Big Bend Ranch State Park in relation to the major highways (numbered) and towns in this region of Trans-Pecos Texas.

> kinds of trade without paying duty to either Mexico or the United States (West Texas Geological Society, 1965, p. 77).

One of the “trade” routes passed near Lajitas and this activity gave name to Contrabando Dome, Contrabando Mountain, Contrabando Creek and Contrabando Canyon. Liquor and cattle were the main items smuggled back and forth across the border of Mexico and Texas.

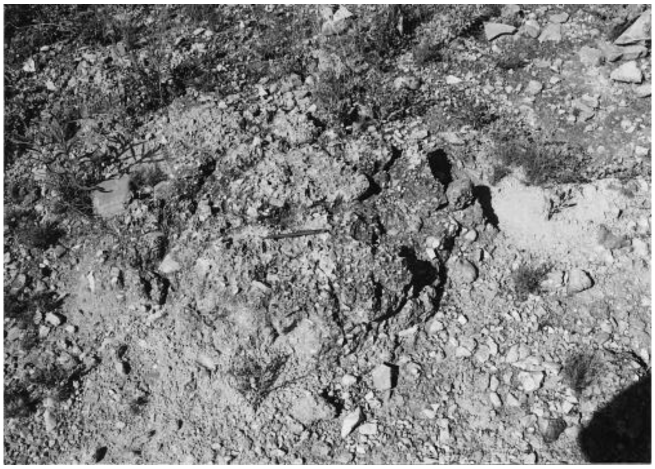

Figure 3. Pieces of limestone breccia from collapsed roof of cave, now lying on the floor of the amphitheater have been cemented together by reprecipitated calcite. Five and one-half inch mechanical pencil on the cemented breccia as a scale.

> Some contrabandistas made their way to West Texas railroad towns where they received shipments of merchandise that was secretly taken across country to the larger cities in Mexico (West Texas Geological Society, 1965, p. 78).

The amount of trade was sufficient to bother the Mexican government. Thus the Fiscales (Mexican river guards) were paid a salary as well as one-half of the captured smuggled goods. The trade was slowed for awhile, but the contrabandistas learned to avoid the guards and for several years the smuggling continued.

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____________1996. The formation of Santa Elena Canyon, Big Bend National Park: Origin speculations. *CRSQ* 33:89-96. Also a Society sponsored study on the solution of limestone and the deposition of $CaCO_3$ is of interest to the conjectures contained in this letter can be found in Williams, E. L. and R. J. Herdklotz. 1977. Solution and deposition of calcium carbonate in a laboratory situation II. *CRSQ* 13:197-198.

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RESEARCH AND EDUCATION PROGRESS
LAB DIRECTOR'S REPORT

JOHN R. MEYER,* Director of the CRS Van Andel Creation Research Center

A number of important events are happening at the Van Andel Creation Research Center. The Lord has blessed and the generous regular support of many members and friends who are partners in our work has allowed us to continue to expand our research and educational efforts. Our challenge to evolutionary philosophy at the technical and scientific level continues to expand. Several items may be of special interest.

Our radiometeor system for monitoring incoming meteors is in the final phase of testing and evaluation. With a few more minor modifications we should be able to provide continuous coverage of meteor activity over a wide area of the southwest United States. Since meteors are thought by evolutionists to be left-overs from the "big bang" origin of the universe, we are very close to being in a position to challenge this evolutionary assumption based on laboratory-derived data.

As I write this report, our new research greenhouse is under construction down the drive from our main building. This rugged and energy efficient 24 by 48 ft. building will have two separate rooms with automatic climate control. By the time you read this report that facility should be completed and studies on the limits of the Genesis kinds in plants in the modern world should be under way. Since many plants show amazing design characteristics, these will also be a focus of our research. We are grateful to the Jay and Betty Van Andel Foundation for providing the funds for this unique and important new research facility. So far as we are aware, it is the only research greenhouse in the world dedicated exclusively to origins research from a creationist perspective.

We have just finished our fourth Creation Quest Wilderness Trail Ride. We now have nearly 40 alumni from these trips who have ridden with us in the Superstition Wilderness east of Phoenix and the Bob Marshall Wilderness in northern Montana. For example, 30 people have ridden with us for seven days in the Bob Marshall area. Each trip involved about 100 miles of riding in the largest wilderness area in the lower 48 states. Evening campfire meetings were characterized by creation studies. This remote area is the home of grizzly bears, mountain goats and elk. Nearly every evening curious deer roamed through our camps. The famed Chinese Wall and the Lewis Overthrust provided great scenery and geological intrigue. Watch for announcements of future Creation Quest Wilderness trips. Ride the high country with CRS!

We continue a busy speaking schedule involving camps, churches, retreats and other conferences. I am now an adjunct faculty member at three Christian graduate schools and will be teaching two modules on origins next year.

We have instituted an electronic fund transfer service for our financial partners and we pray that a growing number of friends will find this a convenient way to provide regular support for our work.

This summer we have had many members and friends visit the Van Andel Creation Research Center. We are not established as a museum or visitor's center but we have found considerable interest in tours of our facilities. Perhaps you can visit the Van Andel Creation Research Center on your next trip to northern Arizona. Call us well ahead of time to schedule a tour. Join us in "evaluating science in a Biblical framework."

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Quote - Heaven and Earth Cry Out That They Have Been Created by God.

Behold, the heavens and the earth are; they proclaim that they were created; for they change and vary. Whereas whatsoever hath not been made, and yet is, hath nothing in it, which before it had not; and this it is, to change and vary. They proclaim also, that they made not themselves; "therefore we are, because we have been made; we were not therefore, before we were, so as to make ourselves." Now the evidence of the thing, is the voice of the speakers. Thou therefore, Lord, madest them; who art beautiful, for they are beautiful; who art good, for they are good; who art, for they are; yet are they not beautiful nor good, nor are they, as Thou their Creator art; compared with Whom, they are neither beautiful, nor good, nor are. This we know, thanks be to Thee. And our knowledge, compared with Thy knowledge, is ignorance.

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PANORAMA NOTE

False Rb-Sr Isochrons: Response to G. Herbert Gill in *CRSQ* 33:105-108

The need for a comfortable treatment of radioisotope age data within a young-earth creation model calls for the best efforts of individuals from a wide range of insight and competency. Herbert Gill has made a commendable effort to foster a better understanding of radioisotope isochrons from the young-earth perspective. His treatment in *CRSQ* 33:105-108 deserves careful analysis.

Isotopic Composition of Strontium

According to the latest data from the National Nuclear Data Center (Tuli, 1995) strontium is universally characterized by the stable isotope ratios listed in Table I.

Table I: Stable Strontium Isotope Abundances

Isotope	Percentage Abundance
84	0.56 ± 0.01
86	9.86 ± 0.01
87	7.00 ± 0.01
88	82.58 ± 0.01

According to these data the Sr-87/Sr-86 ratio is 0.710 ± 0.001. These values are expected averages of a large number of carefully-controlled determinations, and do not represent strontium that has had a significant contribution of Sr-87 from radioactivity of rubidium. The Sr-87/Sr-86 ratio in minerals that contain rubidium may be as high as in the l-10 range (Fame, 1986). Table II lists Sr-87/Sr-86 ratios from Gill's data source (Austin, 1995, Table 6.5, p. 125).

Table II: Sr-87/Sr-86 Ratios from Austin

Sample #	Stated Sr-87/Sr-86 Ratio	Ratio from mol/g Data
QU-1	0.70470 ± 0.00001	0.7044
QU-2	0.70722 ± 0.00001	0.7071
QU-5	0.70504 ± 0.00001	0.7045
QU-14	0.70652 ± 0.00001	0.7059
QU-14S	0.71131 ± 0.00001	0.7107

The last column of Table II is the ratio of isotope concentrations in gmol (mole fractions). The first number in this column, e.g., is $5.91x10^{-7}$ divided by $8.39x10^{-7}$.

Evidence for a Third Isochron Variable

The gmol data for QU-1, QU-2, QU-5, and QU-14 are plotted in Gill's Figure 3, and yield a regression line

$$Sr\text{-}87 = 0.05852 + (0.6973 \times Sr\text{-}86).$$

It should be noted that this regression line is based on only four data points, and that to reach the zero-point intercept, 0.05852, the regression line must be extrapolated approximately 2.5 times the range covered by data. Under these circumstances the one- σ uncertainty specifications for intercept and slope are 0.058 + 0.029 and 0.6973 + 0.0039. A zero value for the intercept is on the lower boundary of the 95% confidence range (±0.058). A straight line drawn from 0,0 of Gill's Figure 3 will pass through each of the four data-point circles on this figure. It is evident that a presumption of 0,0 intercept on a Sr-87 vs Sr-86 plot is not disallowed by the data. If the data-point circles in Gill's Figure 3 cover a smaller range than the experimental uncertainties in the raw data for gmol concentrations of Sr-87 and Sr-86, as is most likely, there is even stronger evidence against the concept that the Sr-86 concentration is a "new variable" that makes a "simple linear regression ... mathematically invalid...."

The slope of the regression line, 0.6973, a Sr-87/Sr-86 ratio, should be compared with the values given in Table II. Since the upper bound of the 95% confidence range for this slope is 0.705 (0.6973 ± 0.0078), there is satisfactory agreement, given the small number of data points (four) and the uncertainties regarding both precision and accuracy of the raw data.

Isochron Basics

A Rb-Sr isochron displays daughter Sr-87 concentration against parent Rb-87 concentration on an atom for atom basis. This may be done on a gmole per cubic micron (or other suitable unit of volume) basis. It may also be done in reference to some isotope that is not involved in the Rb-87/Sr-87 relationship. The reference isotope could be an isotope of magnesium or silicon, e.g.; but it is desirable to use an isotope for which the ratios would not be affected by possible chemical or physical changes. Another isotope of the daughter element is ideal in this respect. Sr-87/Sr-86 ratios provide a secure indication of Sr-87 concentration. Chemical and/or physical changes during the history of a mineral can change the rubidium/strontium ratio, making the Rb-87/Sr-86 ratio an insecure indication of radioactive change in Rb-87 concentration. Such change is referred to as "resetting of the atomic clock".

Furthermore, the data from the mass spectrograph with which determinations are made are basically ratios between the concentrations of isotopes. The closer the mass of the reference isotope is to the mass of the isotope with which it is compared, the greater is the precision that is readily obtainable. Mass ratios may be obtained to precision several orders-of-magnitude greater than the precision of concentration determinations.

For these reasons Sr-86 is an ideal reference isotope for determining Sr-87/Rb-87 ratios. The ratios of Sr-86 to the other stable strontium isotopes, 84 and 88, are not significant to the determination of Sr-87/Sr-86 and Rb-87/Sr-86 ratios as used for determining the Sr-87/Rb-87 ratio in any particular specimen. Variations in Sr-86 concentration among a group of samples have no influence on the Sr-87/Rb-87 ratios determined from Sr-87/Sr-86 and Rb-87/Sr-86 determinations.

A Young-Earth Perspective on Radioisotope Isochrons

The interpretation of a linear array of daughter isotope versus parent isotope data as a mixing line, rather than an isochron, whenever the isochron age is inconsistent with determinative criteria, is well-established in geochronology studies. Interpretation as a mixing line is equally suitable for data that yields an isochron age inconsistent with young-earth criteria (Brown, 1994). There is no need for creationists to seek a rationalization that purports to invalidate the the mathematical basis for the isochron/mixing-line concept.

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Living Bacteria and Other Living Microbes Have Been Isolated from the Abdomens of Fossil Bees Thought to Be 30 Million Years Old

Can bacterial endospores germinate to form living colonies after remaining for 30 million years trapped in fossil amber? Raúl Cano and Monica Borucki (1995) of California Polytechnic State University believe so and they have apparently demonstrated the germination of such spores. Using techniques that appear to have precluded any sort of contamination by modern microbes, these two microbiologists were able to culture colonies of *Bacillus sphaericus* (and some other species of bacteria, yeasts, and even fungi) from fossil bees. They took this material from the abdomens of extinct stingless bees *(Proplebeias dominicana).* These insects were preserved in amber derived from Dominican Republic strata thought to be between 25 and 40 million years old (Knight, 1995).

The experimenters used a clean lab hood and they surface-sterilized the amber with chemicals. Upon cracking open the amber, they dissected out the stomach contents of the fossil bees and incubated them in sterile culture conditions.

Knight (1995), a *Daily News* staff writer, has drawn clever parallels between this study and the film "Jurassic Park." Fischman (a columnist for *Science* magazine) indicated that, prior to this report, the previous documented time record for bacterial endospore germination was only 70 years. While sounding convinced of the veracity of these astounding results, Fischman noted that other scientists were greeting the research results of Cano and Borucki with "...amazement, grudging acceptance-and calls for other labs to repeat the findings" (Fischman, 1995, p. 977).

Interested readers can wade through the details of their excellent report on a three-year scientific program which involved, among other things, extracting sequences of ribosoma1 DNA and comparing these to a Gen Bank database of bacterial rDNA genes for purposes of identification (Cano and Borucki, 1995).

Cano and Borucki are not the only workers to have found that ancient bacteria are viable. In a newspaper account, Shomshak (1974) reported on Roy Cameron's discovery that various drilling cores of the Dry Valley Drilling Project, Antarctica (dating from 10,000 years to one million years) contained living bacteria (Cameron and Morelli, 1974; Abyzov, 1993, p. 266). In the newspaper article, Shomshak noted that shortly after these findings were published, Cameron received a form letter cancelling his National Science Foundation grant for continued Antarctic studies.

Some fascinating implications emerged for origins students from this research:

> The results of the morphological, biochemical, enzymatic, and molecular characterization ... support the hypothesis that a viable *B. sphaericus* spore was recovered from the abdominal contents of *P. dominicana* entombed in 25-to-40-million-year-old amber. The putatively ancient isolate resembles known endosymbionts of modern bees (Cano and Borucki, 1995, p. 1063).

In other words, the germinating bacteria (thought to be 25 million years old or older) are similar to the modern living bacterial species, *B. sphericus.* If these spores were actually dormant for 25 million years, this would demonstrate that precious little bacterial evolution had taken place during countless generations. Such a conclusion would be damaging to the standard evolutionary paradigm.

In a comprehensive research project on fossil ants from Dominican amber (published in *CRSQ),* other workers noted that the fossil ants they studied were "... so similar to our current ant fauna [that] evolutionists lose interest in them" (Vierbergen and Scheven, 1995, p. 158). It appears that very little ant (or bacterial) evolution has occurred from the time these amber beds formed to the present.

I believe Cano and Borucki's results support another conclusion, however, a conclusion that neither the researchers nor the reporters have discussed. We can assume that bacterial endospores respire very slowly because all cells that are not deep frozen respire to some extent, as long as they are alive. If their respiration rate had ever dropped completely to zero, they would have died and would not have "broken dormancy" in the 1990's. Even at a low and almost undetectable respiration rate, it would seem that the spores (which are only a few microns wide) would have exhausted their small quantity of stored food and would have died of starvation long before the supposed 20 million years had elapsed. Cameron's Antarctic bacteria that were deep frozen might have been able to escape metabolic demands for long time periods. Bacteria and other cells in the bee abdomens from the Dominican Republic, however, would have faced higher temperatures and correspondingly higher metabolic rates.

The fact that the spores and other cells are alive and able to germinate supports the belief that the amber and its surrounding strata were formed quite recently, perhaps only a few thousand years ago. Cano and Borucki's finding that living bacterial endospores, other prokaryote cells, and even eukaryotes like yeast in these bee abdomens are still viable falsifies the notion that the amber deposits themselves are 30 million years old. As Vierbergen and Scheven (1995, p. 170) implied in their study of fossil ants, the Dominican amber beds fit quite well in a young-earth origins model. Evidently they formed recently, either before or after the global flood reported in Genesis chapters 7-9.

Acknowledgement

I thank Ed Back for bringing Knight's news article to our attention. I appreciate the assistance of two anonymous referees in improving this report. Likewise, I am indebted to Eugene Chaffin for help in editorial and bibliographic matters.

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BOOK REVIEWS

The Demon-Haunted World by Carl Sagan. 1995. Random House. New York. 457 pages. $20.00.

Reviewed by Don B. DeYoung*

This 30th and last book by Carl Sagan was published one year before he died of cancer at age 62. The content ranges widely: U.S. science education, television's X-Files, witchcraft and nuclear disarmament. The book title refers to the mysterious, unexplained side of life. In Sagan's view crop circles, out-of-body experiences, UFO abductions, alien autopsies and the like are all hoaxes. In this many would agree, but Sagan further totally rejects the spirit world, biblical miracles, prophecy and prayer. Science is then exalted as the only source of truth and hope for mankind.

The book is a treasury of psychic hoaxes from centuries past. Sagan also thoroughly debunks flying saucer stories and the current Hollywood promotion of the paranormal. One wishes that Sagan would simply state his materialistic worldview and then support it with evidence. Instead, however, he launches a bitter attack on the Bible and Christianity. One readily notes that other religions are not ridiculed in Sagan's writings. In this otherwise fascinating book, scarcely a page goes by without a jab at biblical faith. Thus Sagan claims that science progress has been quenched by theologians (p. 317). Societies which believe in a "god who lives in the sky" are the most violent (p. 296). The Bible teaches a flat earth (p. 325), racial and gender superiority (p. 366), lies (p. 91) and contradictions (p. 290).

Sagan suggests a scientific test that could disprove a Creator once and for all (p. 278). This would be the finding of evidence for an infinitely old universe, because then (in Sagan's mind) no Creator would be needed. Such an announcement will likely come forth as cosmologists begin to speculate on pre-Big Bang boundary conditions.

Carl Sagan was born in poverty in New York City to parents with a Jewish heritage. The family knew little science, but nurtured his lifelong interest in nature. His parents also instilled a healthy skepticism which he later applied especially to religion. Sagan's heart is fully exposed in this book. Not willing to face his Creator, the spiritual realm conveniently is relegated to superstition and then completely replaced by science. This leads to awkward moments, as when Sagan describes the beauty and elegance that Clerk Maxwell sought in his equations (p. 389). Sagan cannot quite bring himself to acknowledge the Christian testimony and respect for Creation which motivated Maxwell to excel in electromagnetism.

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This book is classic Sagan-style worship of science. As with so many other brilliant scientists, the vast difference between earthly knowledge and godly wisdom is clearly seen. Carl Sagan sadly lacked this wisdom, the essential dimension of life which the Creation Research Society seeks to promote.

Catastrophe Reference Database (CatastroRef - v. 1.2) edited by Steven A. Austin. 1997. Institute for Creation Research. El Cajon, CA. $24.95.

Reviewed by Carl R. Froede, Jr.*

This release of the Catastrophe Reference Database (CatastroRef - version 1.2) is IBM-PC DOS, Microsoft Windows 3.1 (Win 3.1), Windows 95 (Win 95) and Apple Macintosh (Mac) compatible. This program provides abstracts/information from various uniformitarian scientific journals citing catastrophic geology and/or geologic processes and gives the user a means of identifying an important reference in an area of particular interest. The latest version also includes new references to the database bringing the total of articles and papers cited to 605. This reviewer installed and examined the Windows 95 version of this product.

The installation instructions provided with CatastroRef assume the user is proficient in the Win 95 operating environment and it leads the user through a manual installation of the product. There is no automatic installation provided. The Win 95 installation was not easy. However, it was well worth the effort. I found CatastroRef completely Win 95 compatible and it uses the pull-down menu and open windows environment. The program comes with a tutorial which walks the user through the product in the appropriate operating environment. (IBM-PC DOS, Win 3.1, Win 95, or Mac).

The remainder of my review will focus specifically on the Win 95 version of this product. The main menu was intuitive even without the tutorial. It contains pull-down menus which list various options for the user. Austin provides excellent information about the history and development of CatastroRef along with an outstanding overview about how this product can aid the user in thinking catastrophically. This information alone is worth the price.

All of the fonts are easily readable and the clipboard option for text exporting is valuable. There are two ways to find your keyword of interest. The first is a single word (or set of words) search and the second is a two word (or set of words) delimiting search. Both of these options work very well. Although the searches were conducted on a Pentium and resulted in almost instantaneous data hits, I believe that a slower machine would not experience much decrease in the speed of data retrieval. The CatastroRef product performed very well.

There are only three things which I note as areas of future improvement with regard to the revisions of this excellent product. The first is having a means to make the program self-installing in the appropriate operating environment. The second is to show the number of "hits" that were found when a search was performed. Scrolling through a list which might contain 605 files (but which the user is currently unaware) might cause the person to rethink the keyword lookup selection process and select the two-word look-up delimiting option (a very nice feature). The third improvement would be not having a new window open when choosing the next record of a hit. A new data file would be easier to read if it opened into an already maximized window. Selecting the next "hit" would then simply replace the previous text on the screen. Presently the window is not maximized and by selecting the next record the old record is removed from the screen and the new one is opened offset to the previous and you have to maximize the screen again. These are minor issues and should not stop anyone from getting a copy of this low-priced and very valuable product.

If you are interested in catastrophist geology, geological processes, and their applicability to the Flood then this product will be a very useful resource. The amount of information provided within CatastroRef is well worth its low price. Also it is fun to search and learn about catastrophic geology by scrolling through its various abstracts.

I highly recommend this product and applaud Austin's superb means of getting this information out to the folks who need it. This is an excellent piece of software and *more than worth its price.*

Digging for Answers by Carry K. Brantley. 1995. Apologetics Press, Inc. Montgomery, AL. 178 pp. $5.95.

Reviewed by John Kaplan*

Brantley has authored a valuable and necessary addition to creation literature on archaeology. He "digs through" the mountain of radical skepticism surrounding biblical archaeology and exposes the erroneous assumptions upon which it is founded. The historical-critical method encourages skepticism, holds that historic events must have modern analogues, and seeks to correlate historic events within the con-

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text of all history. What follows from this method is that Scripture can never be considered as absolute truth, miracles are explained away, and God does not intervene in human history. Critical scholars proclaim that even though miracles have never actually occurred we should live according to their allegorical truths, to which Brantley responds from 1 Cor 15:17, "if Christ is not risen, your faith is futile and you are still are in your sins" (p. 22).

Archaeology can enhance our understanding of the Scripture. For example, Ugaritic clay tablets have added to our knowledge of Baal and Israel's propensity to worship him. These texts inform us that Baal was the storm god wielding bolts of lightning and whose voice was the thunder. Since Israel's fertility was dependent on rainwater the people entreated Baal for his blessing upon their crops, acknowledging his control over weather. Elijah challenged Baal's prophets by proclaiming that there would be no rain except upon his word, showing that the God of Israel had true power over precipitation. Also, Baal's prophets may have cut themselves similar to another Ugaritic writing which describes how the pagan god El cut himself upon the apparent death of Baal.

Another value of archaeology lies in the confirmation of biblical history. The Mesha stela (also known as the Moabite stone) documents the military victories of Moab over Israel which corroborates 2 Kings 3:5 and contributes additional details. In addition to confirmation and supplementation archaeology can provide background data as well as linguistic information.

Brantley refreshingly adheres to the strict biblical chronology as opposed to some current creationists who seek to stretch it beyond reasonable limits. The author explains:

> A strict reading of the genealogies from Adam to Abraham indicates a relatively recent date for the beginning of the Cosmos. While it is true that genealogical records may contain familial gaps, patriarchal genealogies include chronological references (Genesis 5, 11). These numerical figures remain constant, regardless of generational gaps. Thus, even if Seth were a distant relative of Adam, nevertheless, Adam was 130 years old when Seth was born (Genesis 5:3). We should not dismiss a priori biblical chronology by assuming genealogical gaps. And these chronological indicators place drastic time constrictions on the age of the Earth. To insert the time reflected by the broad archaeological record into biblical chronology would render the genealogical records meaningless (pp. 38-40).

Brantley notes that there are problems with radiocarbon dating and dendrochronology but does not mention the problems associated with Egyptian chronology.

Additional interesting finds include the Tell Dan inscription and Jerusalem's subterranean water system. The stela fragment excavated at Dan verifies the importance of Israel and Judah during the ninth-century B.C. It contains the phrases "king of Israel" and "House of David." Physical evidence suggests a water shaft at Jerusalem which is consistent with the biblical record.

The Dead Sea Scrolls are discussed in some detail. The material discovered includes a complete copy of the book of Isaiah, hymns of thanksgiving, a Manual of Discipline and the Rule of War document. The scrolls are dated by coinage, paleography and other techniques to 250 B.C. to A.D. 70. As to the identity of the people of Qumran, Brantley provides evidence that they were the Jewish sect of the Essenes mentioned by Josephus and Pliny the Elder. Comparing the Hebrew Masoretic text with the Isaiah scrolls from Qumran reveals a greater than 95 percent identical text. This has increased respect among scholars for the accuracy of the Masoretic text. The scrolls also help to authenticate the book of Daniel.

Digging for Answers provides an interesting and readable introduction to archaeology and is recommended to all with an interest in this subject.

Defeating Darwinism by Phillip E. Johnson. 1997. InterVarsity Press. Downers Grove, IL. 131 pages. $10.00.

Reviewed by Don B. DeYoung*

This book follows Dr. Johnson's *Darwin on Trial* (1991) and *Reason in the Balance* (1995). His goal was to produce a shorter book on a less technical level for younger students and their parents (p. 9). However Johnson is a deep thinker and this book deserves slow, careful reading. Unfortunately the book contains no index or extensive bibliography. It begins with a letter from a theistic evolutionist. Johnson dissects the letter and discusses three basic errors expressed. The first error is the assumption that the creation-evolution issue involves only the length of the creation days. Second, it is assumed that evolution naturally follows known laws of science, given sufficient time. The third error is to equate creation with faith, and evolution with fact.

Johnson uses helpful humor in his discussion. He refers often to Microphone Man, a person appearing in the movie *Inherit the Wind*, representing the evolution-based media. "Berra's Blunder" is named for zoologist Tim Berra (p. 63). It describes the common error of equating man-made improvements, such as new cars, with chance evolutionary progress. This blunder in logic also includes the confusion of artificial selection with natural selection. Johnson states that we each need a mental "baloney detector" to distinguish fact from fiction.

Defeating Darwinism discusses several contemporary events: Pope John Paul's toleration of evolution (p. 84), Jonathan Weiner's Galapagos studies of finch beaks (p. 51), and Michael Behe's molecular complexity writings (p. 76). Johnson makes an important prediction at the book's conclusion. Just as the intellectual systems of Marx and Freud have collapsed, so will that of Darwin, and perhaps soon (p. 113). This paradigm shift will occur when Darwinists finally admit that the empirical evidence and their materialist philosophy are going in opposite directions (p. 114). One can only imagine the chaos that will reign in science during this eventual collapse. May this event possibly be a final opportunity to accept biblical creation before the end of this age?

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Genesis Unbound by John H. Sailhamer. 1996. Multnomah Books. Sisters, OR. 257 pages. $13.00.

Reviewed by Don B. DeYoung*

Theologian John Sailhamer is professor of Old Testament at Western Seminary in Portland, Oregon. His book promotes a novel view of Genesis l-2 which he calls Historical Creationism. Sailhamer believes the biblical account describes only the limited preparation of Israel's Promised Land, not the creation of the entire heavens and earth. He strings together a number of clues to support his case. Although the view appears to solve a number of problems, it raises a host of others. Four of these problems are discussed in the next paragraph.

First, the author proposes that Genesis 1:1 describes an initial creation of the universe, perhaps billions of years ago. Then Genesis 1:2 begins the later, local creative work in Palestine only. However, Sailhamer strongly opposes the Gap Theory because he correctly states that there is no grammatical gap between Genesis 1:1 and 1:2 (p. 103). How then can he insert an indeterminate time period between these same two verses without comment? Second, Sailhamer assumes that the preFlood Garden of Eden equals the postFlood Promised Land. But 2 Peter 3:6 declares that the preFlood world was completely obliterated. Thus we have no idea where the original Garden of Eden was located. Third, Sailhamer tells his own children that dinosaurs "were created, lived, and became extinct during the beginning," long before mankind was created (p. 105). This view carries the multiple severe problems of the old-earth creation position (DeYoung, 1997). Fourth, the story of the Genesis Flood is neglected and also is somewhat ridiculed. Sailhamer doubts that "Noah's Ark was stuffed with every kind of dinosaur, pterosaur, and ancient mammal that ever existed" (p. 223).

Let us now look at some of Sailhamer's biblical interpretations. He translates earth in Genesis 1:2 as *land,* the Promised Land or Canaan in particular. The Hebrew word *'erets* indeed sometimes may be used in this sense, and Genesis 1-2 may carry intimations of the future "very good" Promised Land. Typology is a term used biblically to describe a correspondence between people, places, or events, usually between the Old and New Testaments. Examples include Cain as a type of natural man, and Old Testament sacrifices picturing our Lord's redemptive work. Concerning Genesis l-2, however, the primary context is certainly the creation of the entire universe, not just Palestine. "Let there be light" in Genesis 1:3 is said to be simply another sunrise of a long-existing sun. In conflict with almost all scholars, Sailhamer claims unconvincingly that Genesis 1 "does not demand, or even allow for" the creation of the sun, moon, and stars on the fourth day (p. 31). Again, in apparent direct conflict with Genesis 1:11, he concludes that since most plants are not explicitly mentioned in the verse, "clearly they were not created on the third day" (p. 32). He believes plants had been made eons earlier in an initial creation, with just a few select new plants appearing on the third day, locally in Eden. The seas of Genesis 1:10 are assumed to be limited only to the Mediterranean, Sea of Galilee, and Dead Sea (p. 126). Are we to believe that every possible kind of sea creature (Genesis 1:21) lives in these three bodies of water?

Some aspects of *Genesis Unbound* are disappointing. The author makes the often-repeated mistake of placing the Creation Research Society in San Diego, confusing our Society with the Institute for Creation Research (p. 173). Sailhamer apparently does not know the geography of the major creationist organizations in the U.S. He also confuses and completely reverses the common definition of scientific creation (pp. 44, 71). In discussing the "unformed and unfilled' of Genesis 1:2, *tohu wa-bohu* Sailhamer makes no reference to the classic work by Weston Fields (1976). Perhaps most disappointing, the book is very repetitive and carries no bibliography or index.

I end this review on a positive note, for *Genesis Unbound* contains some excellent material. Sailhamer is correct in challenging the old-earth creationists' acceptance of the big bang theory. He eloquently describes the original creation events as entirely beyond our comprehension. These initial events were "from a human perspective, unique and unrepeatable acts of God" (p. 245). As Sailhamer suggests, the future Promised Land may well be hinted at in Genesis l-2. However, to limit these foundational chapters to the Holyland exclusively, or even primarily, is to strain Scripture completely beyond reason. The creation week encompassed the entire universe. Dr. Sailhamer's view of only one small strip of land is far too narrow.

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PHOTO ESSAY

Contrabando Dome at Big Bend Ranch State Park and Big Bend National Park Badlands

A. A panoramic view of a portion of Big Bend Ranch State Park, Texas from F. M. 170 highway about 5.5 miles west of Lajitas, Texas. Contrabando Dome dominates the center of the photograph. The Solitario Dome, one of the world's largest laccoliths is located in this state park which is adjacent to Big Bend National Park. This region of Trans-Pecos Texas offers considerable field study opportunities for creationists. Also it is one of the most scenic and desolate sections in the United States of America. Photograph by Glen W. Wolfrom; caption by Emmett L. Williams.

B. A wide angle view of the Maverick Badlands at the western edge of Big Bend National Park, Texas. Petrified (silicified) and charcoalified wood have been found in the badlands. The petrifaction and charcoalifaction of wood have been discussed from a creationist viewpoint previously (Williams and Howe, 1993; Williams, 1993; Williams, Matzko, Howe, White and Stark, 1993; Williams, Howe, Matzko, White and Stark, 1995). It is likely that the processes of petrifaction and charcoalifaction occur rapidly. Petrifaction generally requires a silica-rich environment and charcoalifaction requires high temperatures. Both could be provided by volcanic eruptions. Photograph by Glen W. Wolfrom; caption by Emmett L. Williams.

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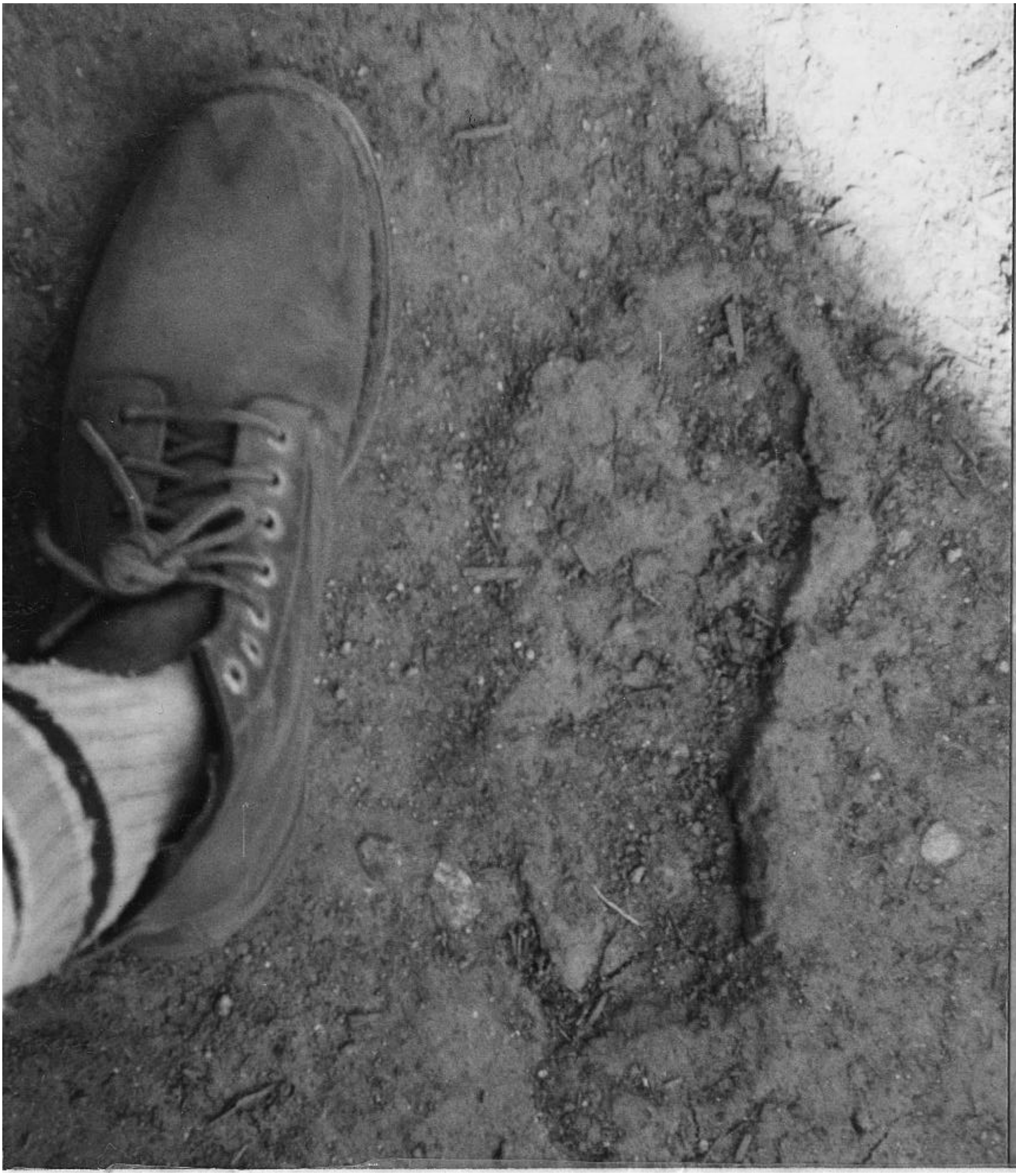

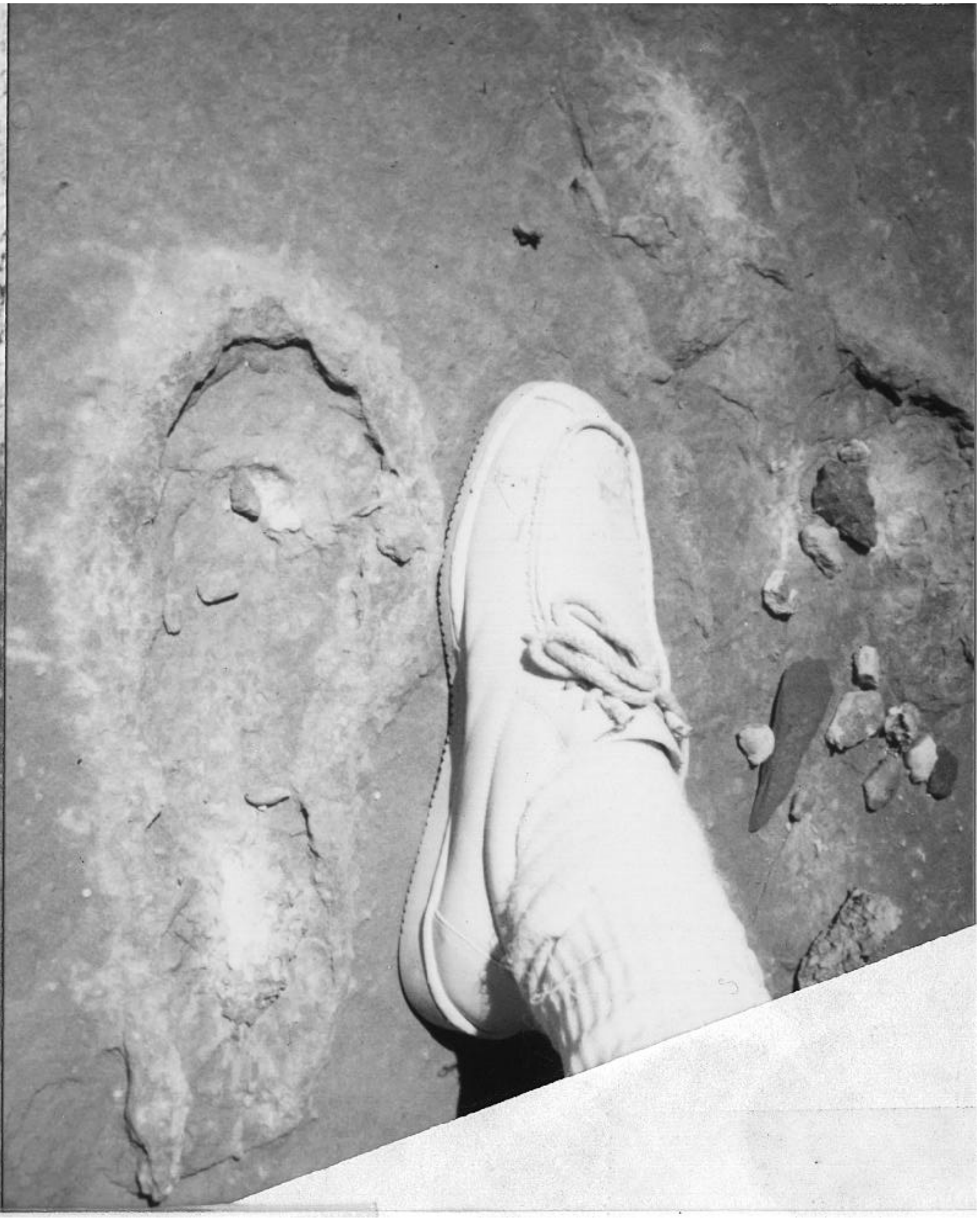

CONTEMPORARY TRACK (See Page 133) QUASIHUMAN ICHNOFOSSIL